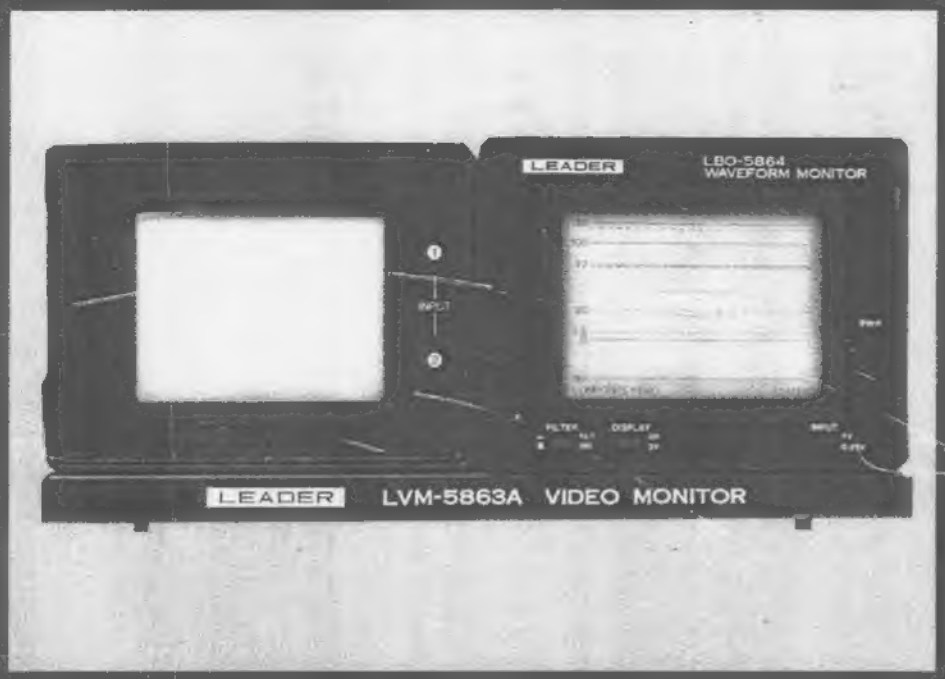
LVM-5863A
EFP Monitor



instruction manual

For professionals who know the difference.

LEADER Instruments Corporation

LVM-5863A
TABLE OF CONTENTS
EFP/ENG MONITOR

1. GENERAL INFORMATION

1-1 INTRODUCTION

The LVM-5863A combines a miniaturized color picture/audio monitor with a waveform display to provide full monitoring facilities for electronic field production (EFP) and electronic news gathering (ENG) operations. Powered from its own batteries, or any source of 12 Vdc such as battery belts or vehicular power, the unit adds the confidence of immediate monitoring with minimum weight, bulk and power drain.

1-2 FEATURES

- Small and light, only 8 lbs. without batteries.
- Fixed 2H and 2V waveform display provides the most useful monitoring waveforms with a minimum of operator controls.
- Internal IRE graticule for accurate checks of signal components.
- Full color picture display.
- Built-in speaker for audio monitoring.
- Low battery drain; only 1.2 A for extra battery life.
- Independent power switches permit lower power drain if only picture or waveform monitoring is needed.
- Accepts dc power from a variety of available sources.
- Low battery warning.
- Rugged carrying case and shoulder strap.
- Companion vectorscope, Model LVS-5854, adds chroma monitoring facilities.

1-3. SPECIFICATIONS

WAVEFORM MONITOR (LBO-5864)

Sensitivity (full scale)	1 Vp-p (for 140 IRE units) or 0.25 Vp-p, switchable
Video Bandwidth (switchable)	Flat: 25 Hz to 5 MHz, ±5% IRE: Based on response per IEEE 205-1958 (28 dB down at 3.5 MHz)
Time Base	2H or 2V, switchable
DC Restoration	Back Porch Clamp
Graticule	Internal, calibrated in IRE units

POWER REQUIREMENTS

Supply Voltage	12 Vdc (nominal)
Current Drain, total	1.2 A
Power Consumption, total	14 W
Batteries	Sony NP-1 or equivalent (side mounted)
(not included)	Sony BP-90 or equivalent (bottom mounted)

GENERAL

Color System	NTSC
Screen Size (measured diagonally)	Waveform Monitor: 2.75 inches Picture Monitor: 2.6 inches
Video Input Impedance	1 Vp-p 75Ω (automatic hi Z for loop-through operation)
Video Input Connector	BNC
Audio Input	390 mVrms nominal
Audio Input Impedance	47 kΩ, unbalanced
Audio Connector	RCA-type phono jack
Operating Time (approximate)	1 hr., 20 min. with NP-1 3 hrs. with BP-90
Power Connector	Coaxial type, center pin negative

PHYSICAL

Size (W x H x D)	8 x 3½ x 10¼ inches
Weight	8 lbs. (3.5 kg) without batteries or carrying case 9¼ lbs. (4.2 kg) with carrying case and NP-1 battery 13¼ lbs. (6.0 kg) with carrying case and both batteries

SUPPLIED ACCESSORIES

Soft carrying case with hood; Shoulder strap
DC power plug with pigtail leads
CH2 input plug with phono plugs

OPTIONAL ACCESSORIES

Carrying Case for BP-90 Battery, LC-2220

OPTIONAL CONFIGURATION

Waveform Monitor only. Order Model LBO-5864.

2. OPERATING INSTRUCTIONS

This section contains the information needed to operate the LVM-5863A. Included are identification of controls, connectors and indicators, system connections, basic operating routines and selected measurement applications.

2-1 CONTROLS, CONNECTORS AND INDICATORS

Before turning on this instrument, familiarize yourself with the controls, connectors, indicators and other features described in this section. The descriptions that follow are keyed to the items called out in Figures 2-1 to 2-4.

2-1-1 Front Panel

Refer to Figure 2-1 for references ① to ⑦

① Color CRT — Displays full color pictures from NTSC input feeds.

② Waveform CRT — Displays 2H and 2V video waveforms on an internal graticule graduated in IRE units.

③ Input Channel LED's — Glows to show which input channel, 1 or 2, has been selected by the INPUT SELECT button (19). One or the other LED also serves as the power-on indicator for the picture monitor section.

④ PWR LED — Glows to show when the waveform monitor section is on. This LED also serves as the low-battery warning. It flashes when battery voltage falls below 10.5 Vdc.

⑤ FILTER switch — Alters video frequency response. For the FLT (flat) setting (button in) frequency response is normal. Press to release (button out) to insert a low-pass filter to remove most subcarrier components. Response in the IRE setting complies with IEEE Standard 205-1958.

⑥ DISPLAY switch — Selects the horizontal time base. Two horizontal lines are shown in the 2H setting (button in). Press to release (button out) to display 2 vertical fields in the 2V setting.

⑦ INPUT switch — Alters vertical deflection sensitivity. The normal 1V setting (button in) provides the standard sensitivity wherein a 1V p-p signal occupies 140 IRE units. Press the button to release it (button out) to boost sensitivity by a factor of four. This makes the 7.5 IRE units for setup appear at 30 IRE units.

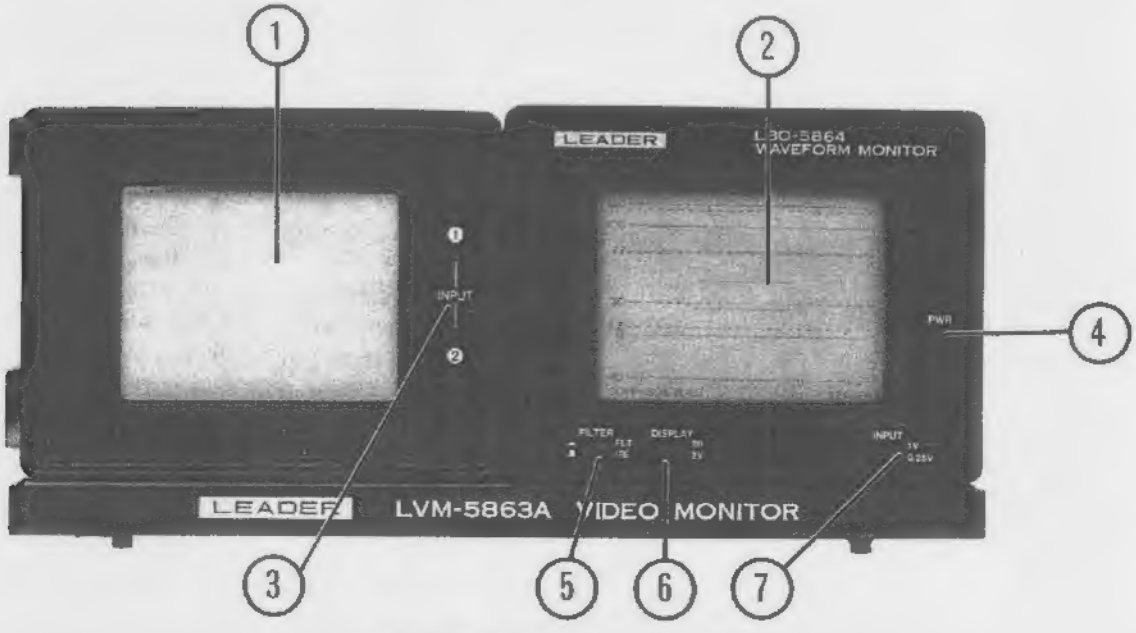


Figure 2-1. Front panel

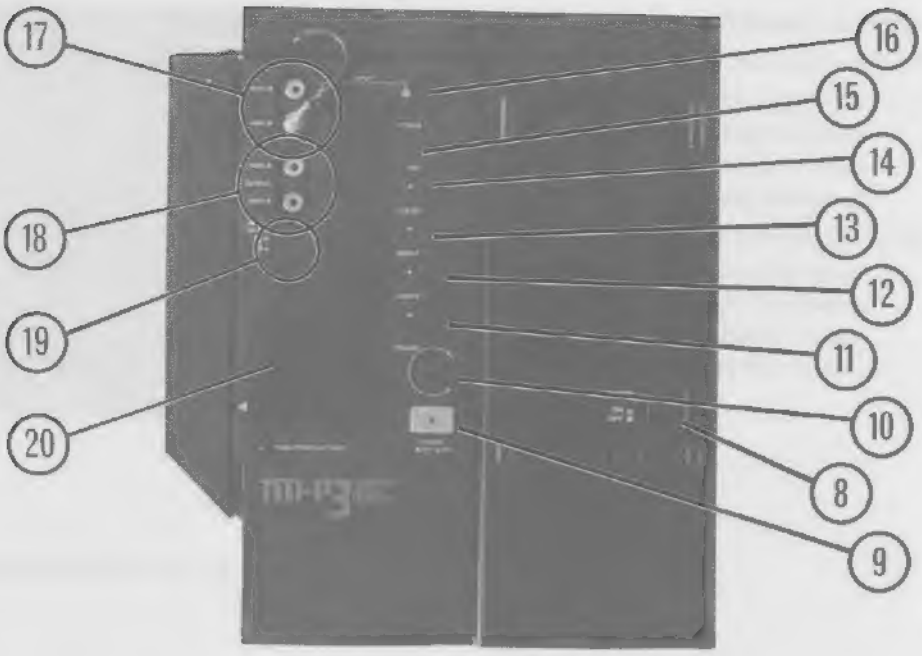


Figure 2-2. Top panel

2-1-2 Top Panel

Refer to Figure 2-2 for references (8) to (20).

⑧ POWER OFF-ON switch	Push to switch on the waveform monitor section. Push again to switch off. The red PWR LED (4) glows when power is on.
⑨ POWER OFF ON switch	Push to switch on the picture/sound monitor section. Push again to switch off. One of the red LED's (3) on the front panel glows when power is on.
⑩ VOLUME control	Turn clockwise to increase volume.
⑪ CONTRast control	Turn clockwise to increase picture contrast. The control is detented at the normal setting for correct video levels.
⑫ BRIGHTness control	Turn clockwise to raise picture brightness. The control is detented for normal brightness setting at average viewing conditions.
⑬ COLOR control	Turn clockwise to increase color saturation. The control is detented at the correct setting for signals with the correct Y:C ratio.
⑭ TINT control	Adjusts decoder phase for correct hues. The control is detented at mid-range for correct color for normal NTSC input signals.
⑮ V-HOLD	Adjusts vertical scan frequency. Set as needed to prevent vertical rolling of the picture.
⑯ 6-pin CH-2 connector	Accepts audio and video inputs to CH-2 via a six-pin connector supplied as a standard accessory.
⑰ Phono-type CH-1 jacks	Accepts audio and video inputs to CH-1 via phono-type plugs. Note: The CH-1 video input jack is normally connected to the loop-through cable from the waveform monitor section.
⑱ Phono-type output jacks	These jacks are for loop-through connections to other video and audio components. Note: The picture monitor is internally terminated for video at the VIDEO OUTPUT jack. Insertion of a male phono plug into this jack removes the terminator automatically.
⑲ INPUT SELECTor switch	Press in to select the CH-2 input from the 6-pin connector (16). Press again to release (button out) to select the CH-1 input. The latter is the normal setting for use with the waveform monitor.
⑳ Speaker	

2-1-3 Side panel (right as viewed from the front).

Refer to Figure 2-3 for references (21) and (22).

(21) ROTATION control	Provides screwdriver adjustment of horizontal trace alignment with regard to the CRT graticule lines.
(22) V. POSITION control	Provides screwdriver adjustment of vertical position of the waveform display. Set to align video blanking with the 0 IRE line on the graticule.

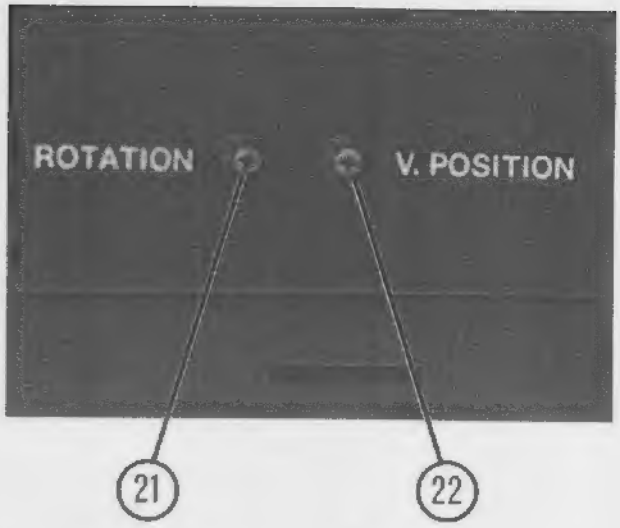


Figure 2-3. Side view, waveform monitor side

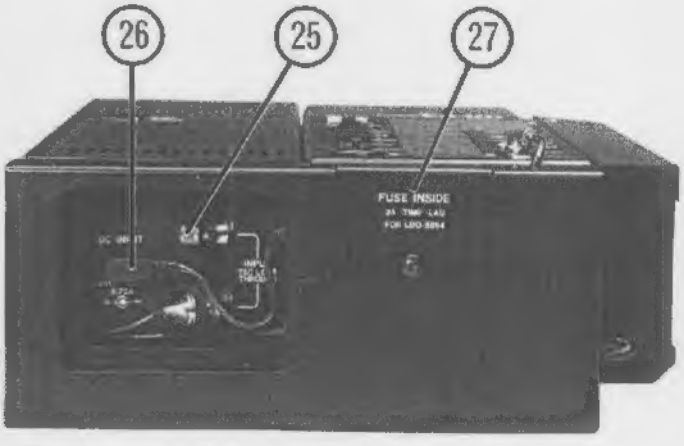


Figure 2-4. Rear panel

2-1-4 Rear Panel and Battery Holder

Refer to Figure 2-4 for references (23) to (27)

(23) Battery compartment	Houses the Sony type NP-1 battery.
(24) DC INPUT jack	Coaxial-type jack accepts 12 Vdc power from the extra BP-90 battery or any source of 12 Vdc power. Note: The NP-1 in the battery compartment is disconnected automatically when a battery or other source of 12 Vdc is connected to the DC INPUT jack (24).
(25) Video INPUT jack	This BNC jack accepts video signal inputs at standard levels. The video signal is looped through the waveform monitor section and terminated in the picture monitor.
(26) DC INPUT jack	Coaxial type jack accepts a male plug from the main frame to provide dc power to the waveform monitor.
(27) Fuse compartment	2A time lag fuse inside. Remove cover by removing the single Phillips head screw.

2-2 VIEWING HOOD

To position the viewing hood, unsnap the lower snap fasteners at each side of the unit and the three snap fasteners at the lower edge. Swing the front cover upwards and open the stiffeners on either side of the display outwards. Reset the two snap fasteners at the lower sides to hold the hood in the viewing position.

2-3 POWER CONSIDERATIONS

The LVM-5863A is designed to operate from the Sony NP-1 battery installed in the battery compartment. This battery may be augmented with the addition of a larger BP-90 that is housed in a compartment that affixes to the bottom of the unit. In addition, any available source of 12 Vdc (11 to 13.8 V) can be used to power the LVM-5863. Note: The NP-1 battery is disconnected automatically when any source of 12 Vdc is plugged into the DC INPUT jack (24).

2-3-1 Operation From the NP-1 Battery

1. Make sure that the NP-1 battery is fully charged before it is installed in the battery compartment. Refer to material supplied with the battery charger.
   Recommended battery charger: Sony Model BC-1WA or equivalent.
2. If the carrying case is in use, open the flap on the forward edge of the battery compartment.
3. Hold the NP-1 as shown in Figure 2-5 and slide it into the battery compartment as far as it will go. Close the flap on the carrying case.
4. Press the waveform monitor POWER ON-OFF button (8). Confirm that the red PWR LED (4) is on. After a few seconds a single horizontal trace should appear on the waveform monitor screen.
5. Switch off POWER if the monitor is not to be used at this time.

2-3-2 Low Battery Warning

The red PWR LED (4) glows steadily when battery voltage is within the range required for normal operation. It begins to flash when battery voltage falls below 10.5 V.

To maintain long battery life, do not continue operation with a depleted battery. Recharge the battery as directed by the literature supplied with the battery charger.

2-3-3 Operation Using the BP-90 Battery

1. Insert the BP-90 into the LC-2220 carrying case so that the power plug can be passed through the hole in the cover flap.
2. Press the cover flap in place using the fastener tape.
3. The soft carrying case for the LVM-5863A should be in place. Stand the LVM-5863A on the four feet at the rear of the unit (CRT screens facing upwards).
4. Remove the clips for the shoulder strap.
5. Slip the buckles of the BP-90 carrying case over the metal feet to which the shoulder strap is normally clipped.
6. Press the BP-90 carrying case against the main unit carrying case to engage the fastener strips. See Figure 2-6.

Figure 2-5. Installing the NP-1 battery

Figure 2-6. BP-90 installation

2-3-4 Operation From Vehicular, Battery Belt or Other Sources of 12 Vdc

1. Connect the source of nominal 12 Vdc to the Power jack (24). Note: The plug required for this connection is of the type used on the Sony BP-90 battery. A mating plug with leads is supplied as a standard accessory. The coaxial type power plug is wired with the outer shell positive and the inner conductor negative. Refer to Figure 2-7.

CAUTION

Double check voltage polarity at the plug before connecting any source of dc voltage to the LVM-5863A. The center conductor must be negative with respect to the outer shell. Reversed connections could damage the LVM-5863 and/or the source of power.

2. Confirm that the power source supplies between 11 and 13.8 Vdc. The power source must be capable of delivering 1.2 amperes continuously.
3. Switch on the waveform monitor at the POWER ON-OFF switch (8) and confirm that the PWR LED (4) on the front panel comes on.

2-4 SIGNAL CONNECTIONS

2-4-1 Basic Video Connection

The basic operating mode makes use of the LVM-5863A as a camera and/or VCR monitor. Connect the source of video to the input BNC VIDEO INPUT jack (25) on the rear panel. In this mode the signal is looped through the waveform monitor section and terminated in 75 ohms in the picture monitor section. Select CH-1 on the picture monitor with the INPUT SELECT switch (19).

2-4-2 Video Loop-Through Connections

Video signal may be looped through the LVM-5863A to drive another video load, such as the line input of a VCR, as shown in Figure 2-8. Connect the outgoing cable to the OUTPUT VIDEO jack as shown using a cable or cable adapter equipped with a male phono plug. Insertion of this plug automatically disconnects the internal terminator and the feed should be terminated in the connected load.

2-4-3- Audio Connections

Connect the source of audio to the INPUT AUDIO jack (17) on the top panel of the picture monitor. Select CH-1 with the INPUT SELECT switch (19).

Audio input is normally high impedance (47 kΩ). The signal level should be approximately -6 dB.

Bridged audio output is available at the OUTPUT AUDIO jack (18).

2-4-4 Use of the 6-Pin CH-2 Jack

Video and audio signals may be fed into the picture monitor section only by means of the 6-pin CH-2 input connector. A six pin plug with cables using RCA phono type plugs is supplied as a standard accessory. Figure 2-9 shows the wiring and feed connections for this unit. Select CH-2 with the INPUT SELECT switch (19).

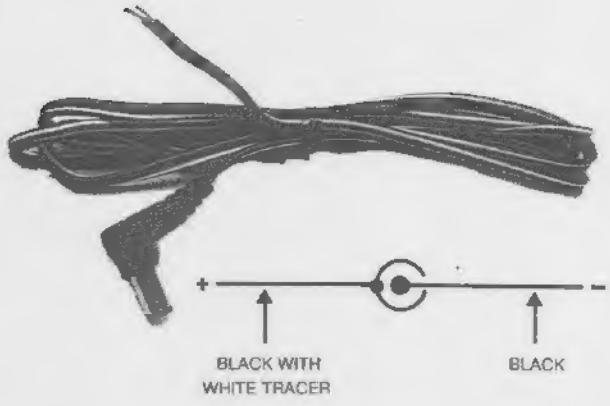


Figure 2-7. DC plug wiring

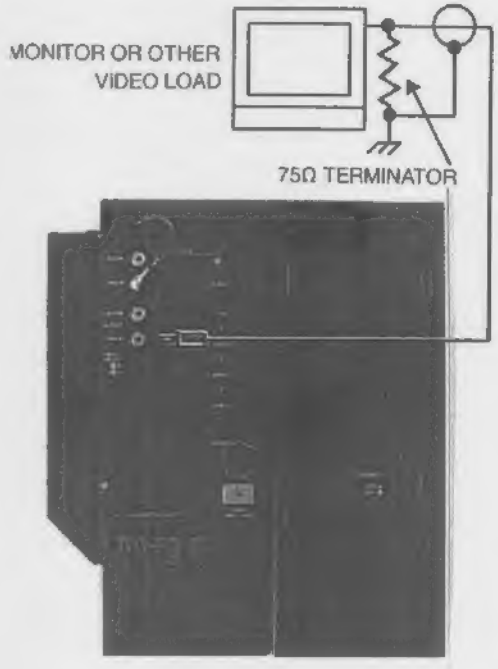


Figure 2-8. Video loop-through from the picture monitor

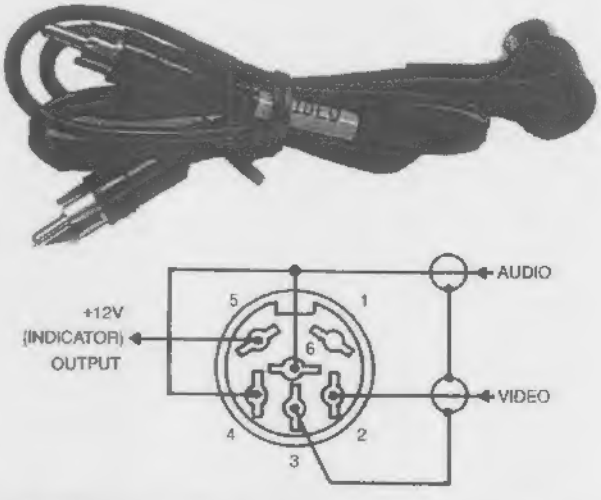


Figure 2-9. Wiring of the 6-pin CH-2 input accessory

2-5 BASIC OPERATING PROCEDURES

2-5-1 Initial Checkout

Equipment required:

Color Bar Generator
Leader LCG-400S/M or equivalent
Audio Generator
Leader LAG-120B or equivalent

1. Connect the LVM-5863A to a source of 12 Vdc power or insert a fully-charged NP-1 battery. Refer to Section 2-2.
2. With no input signal connected, switch on power for the waveform monitor section (8).
3. Wait a few moments and a green trace will appear on the monitor screen.
4. Check for parallelism between the trace and the horizontal lines on the graticule.
5. Using a miniature Phillips screwdriver, adjust the ROTATION control (21) on the right side panel, if necessary, to make the trace parallel with the graticule lines.
6. Preset operating controls as follows:

INPUT SELECT (19):	mid range
TINT (14):	at detented setting
COLOR (13):	at detented setting
BRIGHT (12):	at detented setting
CONTR (11):	at detented setting
VOLUME (10):	fully CCW
FILTER switch (5)	in (FLT)
DISPLAY switch (6)	in (2H)
INPUT switch (7)	in (1V)

7. Connect the color bar generator output signal to the VIDEO INPUT jack (25) on the rear panel. Set the generator to produce EIA color bars at standard 1V p-p level.
8. Switch on power at the picture monitor and waveform monitors (8) and (9). Refer to Figure 2-10 for identification of waveform graticule markings.
9. Allow a few moments for warm-up and check to confirm that the color bar display appears normal on the picture monitor.
10. Observe the waveform monitor and using a miniature Phillips screwdriver, adjust the V-POSITION control (22) on the right side panel to place the blanking part of the signal on the O IRE graticule line. Refer to Figure 2-11(a).
11. Check that the 100% peak-white bar and the positive tips of subcarrier are at the 100 IRE graticule line. Refer to Figure 2-11(a). Check sync level, burst level and setup as shown in the figure.
12. Depress the DISPLAY switch (6) to release it (button out) to obtain the 2V waveform. Confirm that the waveform appears as shown in Figure 2-11(b). Press again (button in) to restore the 2H display.
13. Depress the FILTER switch (5) to release it (button out). This inserts the IRE filter to remove most of the 3.58 MHz chrominance signal. Confirm that the waveform appears as shown in Figure 2-11(c). Press again (button in) to restore normal frequency response.
14. Depress the INPUT switch (7) to release it (button out). This boosts vertical gain by 4X, and makes the 7.5 IRE unit setup level appear at 30 IRE units. Confirm that setup appears at +30 IRE as shown in Figure 2-11(d). Press again (button in) to restore normal sensitivity.
15. Connect the audio generator to the CH-1 audio input jack (17). Set frequency to 1000 Hz, output to -6 dB (0.4 Vrms).
16. Advance the VOLUME control and check for adequate sound level.
17. Switch off power on both units (8) and (9).

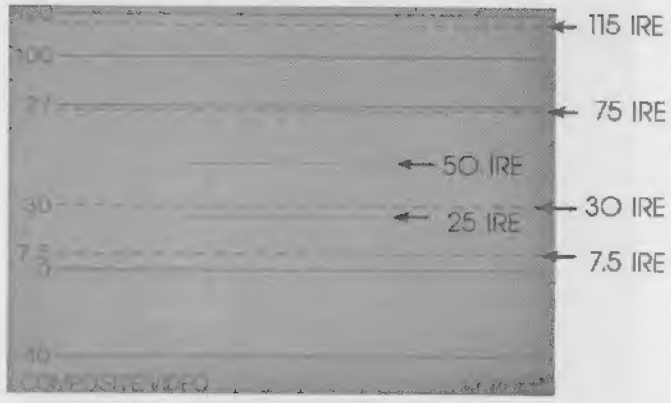


Figure 2-10. Graticule markings

2-5-1 Graticule Markings

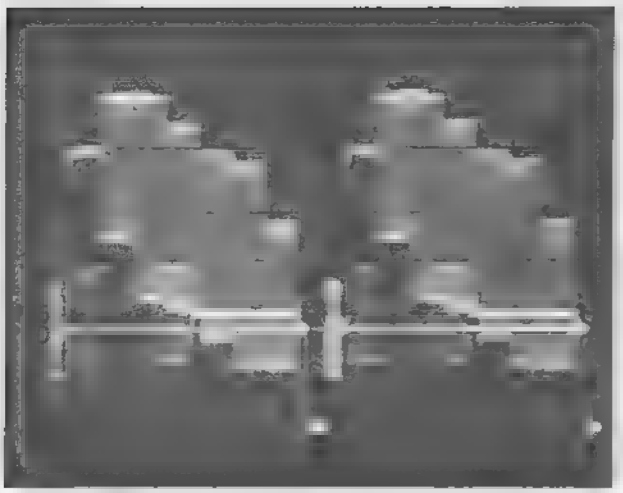
Refer to Figure 2-10 for identification of the internal graticule marks on the waveform monitor. The solid line at zero IRE is the blanking level and V POSITION should be adjusted, if necessary, to place the blanking level of the observed signal at this zero level.

The dashed line just above blanking is at 7.5 IRE, the setup level used in common practice in the U.S. Shorter lines identify 25 and 50 IRE. The next higher dashed line marks 75 IRE units or the level of the 75% white bar in the color bar signal in the absence of setup. The solid line just above the dashed 75 IRE line identifies 77 IRE, the level for the 75% white bar in the color bar signal when 7.5% setup is in use.

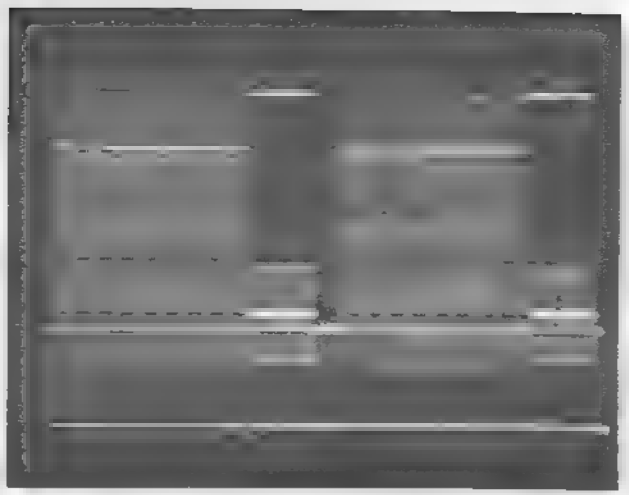
Solid lines at 100 and 120 identify standard peak white and saturation (white clip) levels respectively. A dashed line at 115 IRE identifies the saturation level when setup is zero or 2-3 IRE units.

2-6 APPLICATIONS

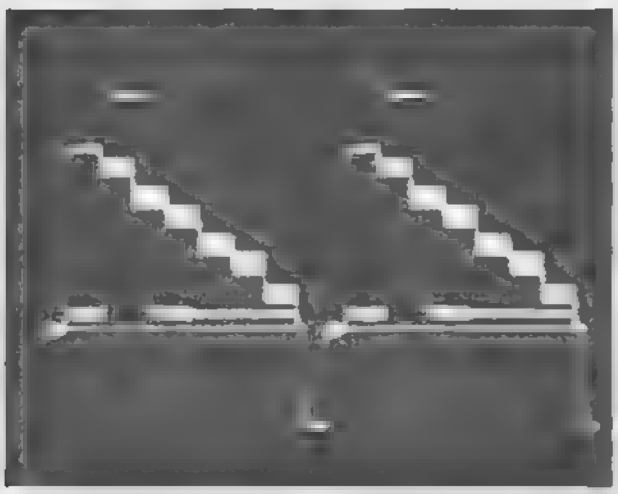
This section shows some of the ways in which the LVM-5863A can be used to verify camera/VCR performance.



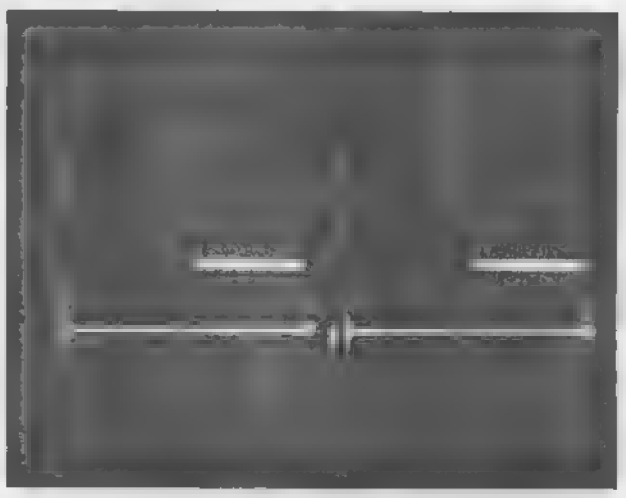
(a) 2H



(b) 2 V



(c) IRE filter



(d) X4

Figure 2-11. Checkout waveforms

2-6-1 Checking Video Camera Signal Components

1. Connect the video output of the camera to the VIDEO INPUT jack on the rear panel of the LVM-5863A.
2. Switch on power to the camera and both units of the LVM-5863A. Leave the camera lens cap in place or set the camera filter wheel to the "blind" setting
3. Set up AUTO BLACK for the camera, if it is so equipped.
4. Check the waveform as shown in Figure 2-12 for correct sync amplitude, burst amplitude and setup. Reset master pedestal on the camera if necessary for the correct 7.5 IRE setup level.
   Note. For a more accurate indication of setup level, depress the INPUT switch (7) to release it (button out) to produce the 0.25 V setting. This boosts deflection sensitivity by a factor of 4 so that the normal 7.5 IRE setup level appears at 30 IRE units. The first horizontal graticule line above the dashed line for normal setup is at 25 IRE.
5. Remove the lens cap and set the camera filter wheel for the appropriate illuminant (3200 K for studio lighting, 6400 K with neutral density filter for outdoor shots).
6. Frame the camera on a flat white card, such as the registration chart, or a neutral gray-scale chart. Execute the auto-white balance for cameras so equipped.
7. Using automatic iris, confirm that the peak-white part of the test chart comes to 100 IRE. See Figure 2-13.
8. Note: For a better indication of peak white levels, depress the FILTER switch to release it (button out). This removes most of the subcarrier from the waveform so that the peak level of the luminance signal can be judged more easily.

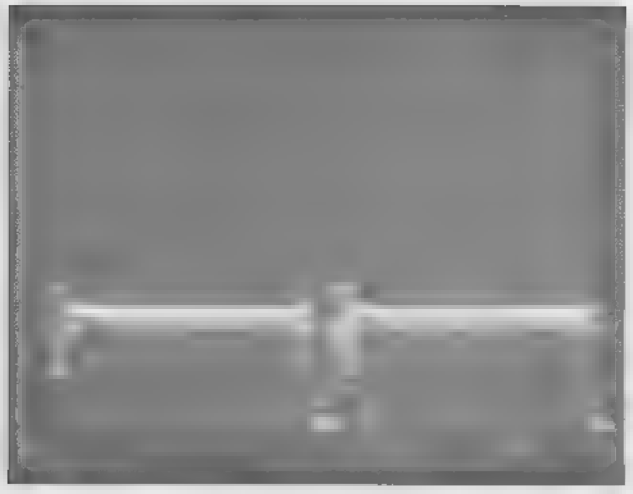


Figure 2-12. Lens capped waveform

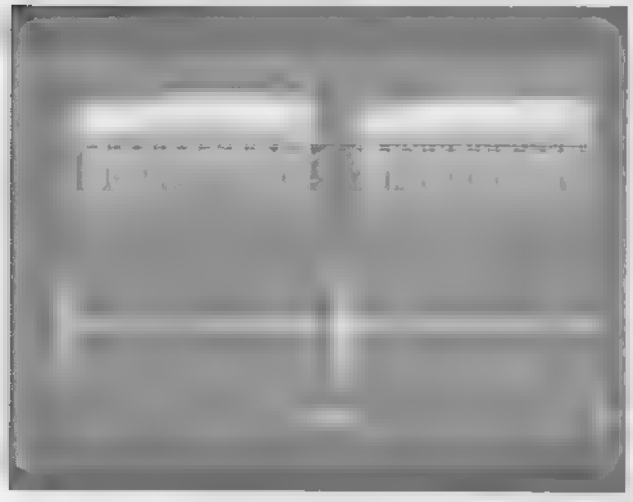


Figure 2-13. Setting peak white at 100 IRE using the white camera registration chart

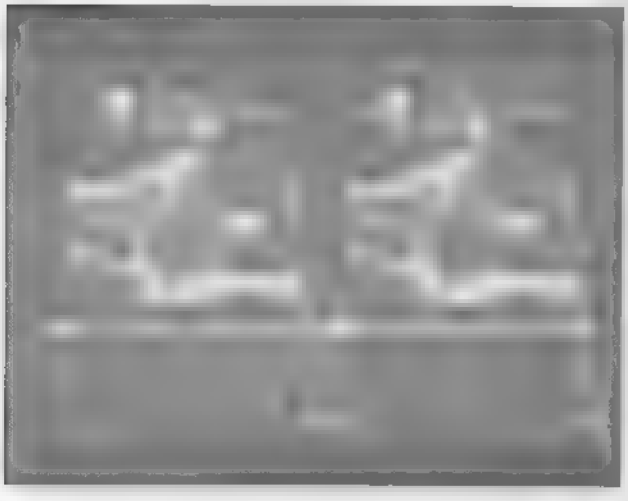


Figure 2-14. Use of the IRE filter on a color scene to set peak white level

2-6-2 Manual Lens-Opening Settings

Automatic iris control is avoided in many shoots to prevent the changes in background brightness that accompanies the appearance of lighter or highly reflective items in the picture frame. To set the iris manually for a given lighting condition, set the camera for manual iris control and aim at a white or nearly white object in the center of the frame. A white card, performer's shirt or any convenient object can be used for this purpose.

1. Locate the white object on the waveform display. See Figure 2 14.
2. Set iris opening so that the peak white signal identified in Step 1 reaches 100 IRE. Note: For a clearer indication of peak luminance signal levels, depress the FILTER switch (5) to release it (button out). This inserts the IRE FILTER, and removes most of the sub carrier signal to make luminance values easier to see.

2-6-3 White and Black Balance Checks

For accurate color rendition the camera must be balanced using the lighting conditions that are used for shooting. When the camera is properly balanced the red, green and blue signals input to the NTSC encoder are equal when the camera is framed on a white or neutral gray subject. Under these conditions, the R-Y-/B-Y or I and Q signals go to zero. Subcarrier output from the encoder then goes to zero as well Thus the indication that the camera is properly balanced is the disappearance of the subcarrier from the waveform.

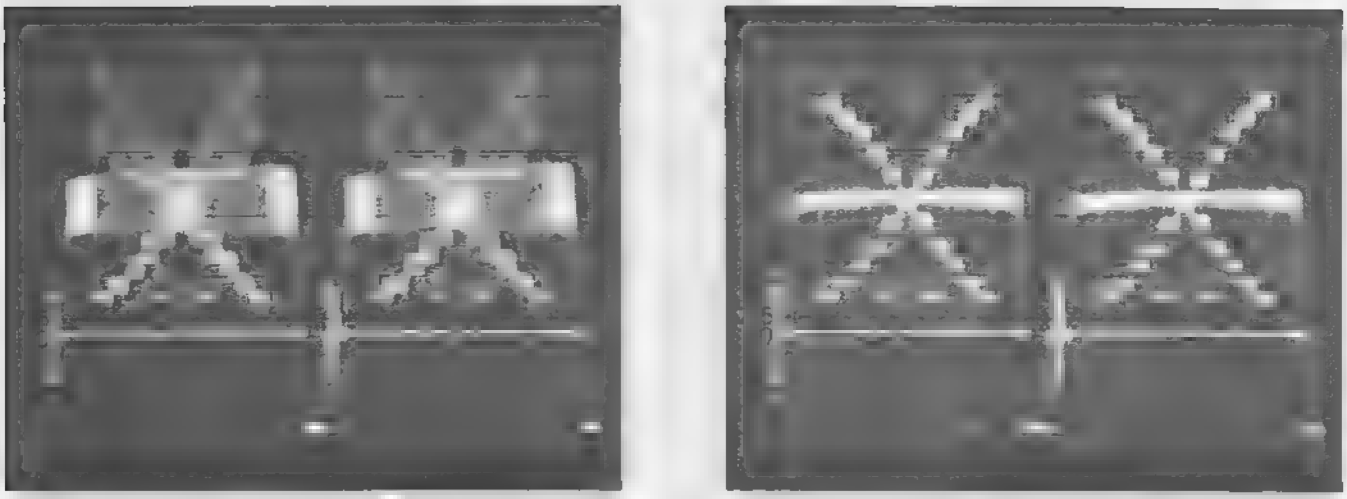
Figure 2-15 shows typical waveforms for a camera framed on a white gray scale card. The left waveform shows the unbalanced condition. The right shows optimum balance A correctly balanced camera will show little or no subcarrier on all the steps produced by the gray scale chart. At this time the picture monitor will display a neutral gray scale Imbalance, which causes subcarrier to appear on the steps of the waveform, causes a definite hue to appear on the corresponding chips of the picture display.

While it is easy to check camera balance, and check auto balance operation, manual adjustments to effect camera balance should be made under controlled (bench) conditions.

2-6-4 VCR Output Level and Y/C Ratio

VCR's that make use of the color-under technique, such as Beta, VHS and U-Format, separate and process the luminance (Y) and chrominance signal separately. To check to see that the VCR has re-established correct Y/C ratios proceed as follows:

1. Make a trial recording using the color bar signal from the camera
2. Connect the video input jack of the VCR to the VIDEO INPUT jack on the rear panel of the LVM-5863A
3. Play back the color-bar segment of the cassette.



(A) UNBALANCED (B) BALANCED

Figure 2-15. Checking camera balance with a neutral gray scale chart

4. Check for correct:
   Luminance level: For the 75% white bar in full field bars the correct level is 77 IRE. See Figure 2-16. For EIA type bars (100% white chip below yellow and cyan in the lower quarter of the picture display) the correct level is 100%
   Chrominance level: Correct chrominance level is indicated for 75% color bars when the positive peaks of subcarrier on the yellow and cyan bars are at the 100 IRE level. See Figure 2-16.

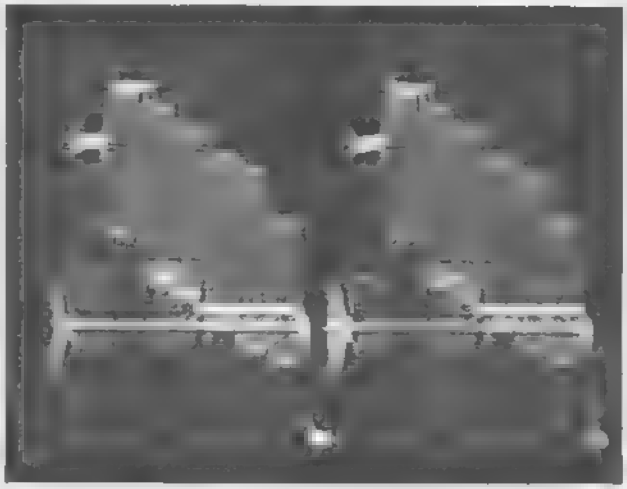


Figure 2-16. VCR playback

3. PICTURE MONITOR MAINTENANCE

3-1 TEST EQUIPMENT REQUIREMENTS

Color Bar Generator: EIA color bars, dot-crosshatch pattern
Leader LCG-400S/M or equivalent

DVM

3-2 DISASSEMBLY

1. Remove power from all units.
2. Remove the 1/4-20 hex-head cap screw marked A in Figure 3-1. Use a 3/16" hex key
3. Lift the picture monitor slightly from the front edge.
4. Lift to clear locating holes in the base plate and put the picture monitor aside.
5. Remove the battery holder from the side of the picture monitor as follows.
6. Press the PUSH POWER UNIT EJECT button.
7. Slide the battery holder toward the rear of the monitor to align the arrows.
8. Gently pull the battery holder from the monitor

Figure 3-1. Remove 3/16" hex head screw to separate the picture monitor from the mounting plate.

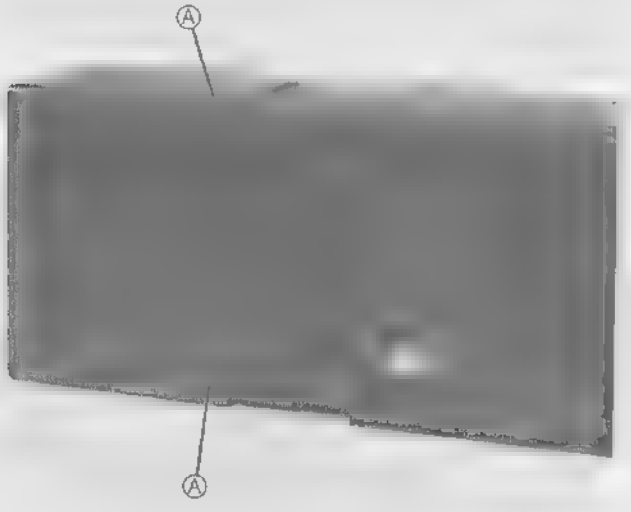


Figure 3-2. Hood removal

3-2-1 Hood Removal

1. Slide the hood forward as far as it will go.
2. Remove the two screws shown in Figure 3-2. Be careful not to lose the two plastic stoppers into which these screws thread. Slide out the plastic stoppers and put them and the screws in a suitable container.
3. Pull the hood out as far as it will go. The hood is now stopped by a plastic latch that engages a stop in the groove that's visible in the top left of the cabinet (as viewed from the front). To free this latch, reach into the upper left corner of the hood with the forefinger and press the hood outwards (towards the battery holder) while gently pulling the hood forward. Pull the hood off carefully.

3-2-2 Top Cover Removal

1. Remove the four screws labelled A in Figure 3-3. These screws are also identified by arrow symbols embossed in the plastic.
2. Using a small screwdriver, push to release the plastic latches (B) behind the slots on the battery side of the case. Squeeze the lower case gently with one hand to keep these latches disengaged. Grasp the top case with the other hand at mid section and raise to free the rear of the case first. Lift the top cover clear

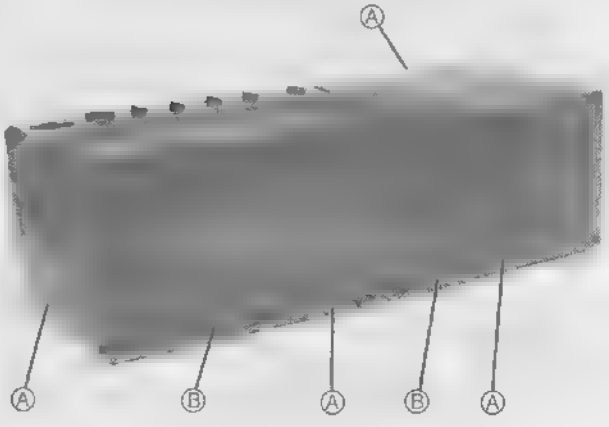


Figure 3-3. Top cover removal

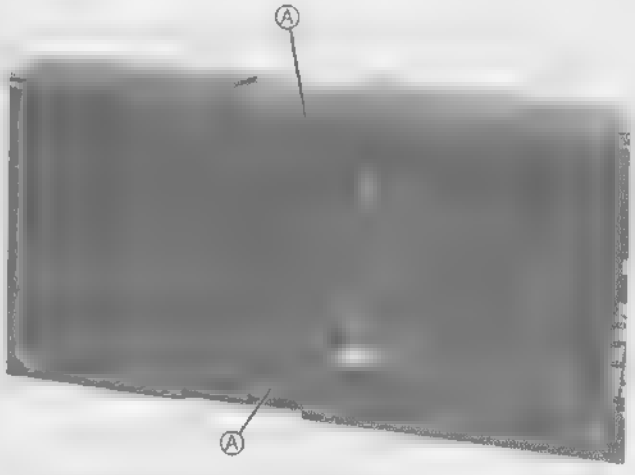


Figure 3-4. Bottom cover removal and PC board access.

3-2-3 Circuit Board Access and Bottom Cover Removal

1. Remove the two screws from the bottom cover that are labelled A in Figure 3-4.
2. Place the unit right side up on the work surface and pry out two plastic canoe clips from each of the side-mounted PC boards. Open the side-mounted boards for service as shown in Figure 3-5.
3. Step 2 also releases the bottom cover which can be worked off carefully if it is necessary to gain access to the bottom of the bottom PC board (Chroma, H and V board)

   Note: Remove wire clamps and ties only as needed, and be sure all wire routes and ties are reset to their original locations.

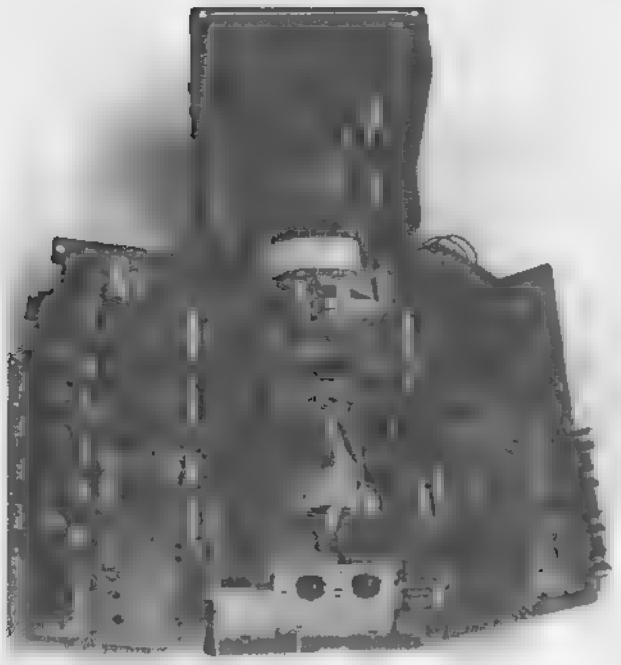


Figure 3-5. Picture monitor disassembled for service

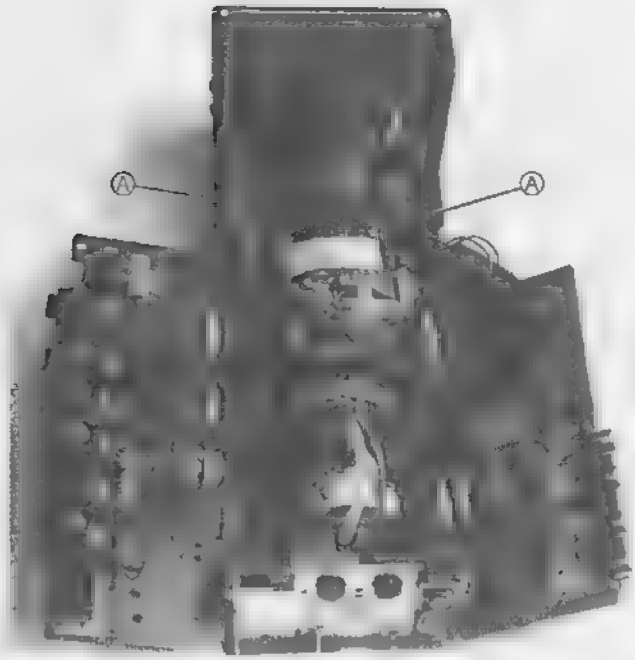


Figure 3-6. Remove screws to free CRT mount

3-2-4 CRT Removal

1. Remove the two screws labelled A in Figure 3-6, and take off the plastic clamp housing
2. Carefully pull off the CRT socket
3. Loosen the clamps on the magnet and yoke assemblies. Carefully remove the magnet and yoke assemblies. It may be necessary to pry the assemblies from the cloth tape on the CRT neck to free them. Cut any sealant that secures the deflection yoke to the CRT bell

3-3 ADJUSTMENTS

3-3-1 11 V Supply Adjustment

1. Connect a source of 12 Vdc to the battery terminals on the side of the unit as shown in Figure 3-7. Use insulated alligator clips and *observe polarity.*
2. With no input signal, turn BRIGHT fully CCW. Check to make sure that the CRT is cut off. If necessary, adjust Sub-bright, R221, to ensure cutoff.
3. Measure the voltage at TP-91 to ground of the AUDIO and POW REG PWB. Refer to Figure 3-8 Adjust R905 for a reading of 11 V. Ground is the metal back plate.

3-3-2 Beam Landing (Purity)

1. Feed a blank raster signal into the CH-1 INPUT VIDEO jack.
2. Switch off red and blue at the generator to produce a flat green raster.
   Note: If primary colors cannot be turned off with the pattern generator in use, obtain a green raster by turning Green Cutoff, R706, fully CW and Red and Blue Cutoff, R705 and R704, fully CCW. Refer to Figure 3-13.
3. Adjust the SCREEN control for a visible green raster Refer to Figure 3-14
4. Loosen the clamp screws on the magnet and yoke assembly. Refer to Figure 3-9. Carefully slide the magnet/yoke assembly back towards the CRT socket as far as it will go. This should produce a green cloud
5. Align the two tabs of the purity ring on the magnet assembly. Then spread the tabs and rotate the ring assembly to place the green cloud at center screen.
6. Reposition the magnet/yoke assembly so that the green cloud spreads out to produce a uniform green raster at all points on the screen.
7. Check the red and blue rasters and reset yoke position if necessary.
8. Tighten the magnet/yoke assembly clamp screws.

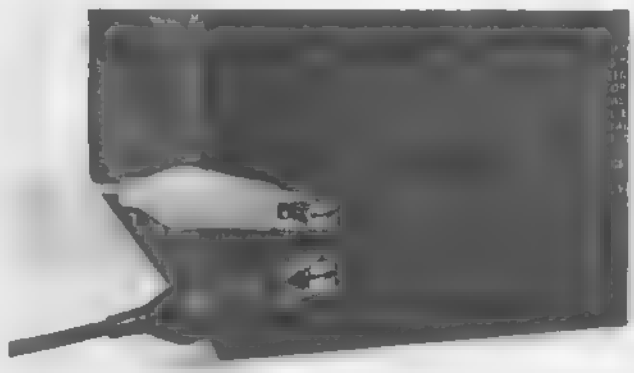


Figure 3-7. Power connections for service of the picture monitor

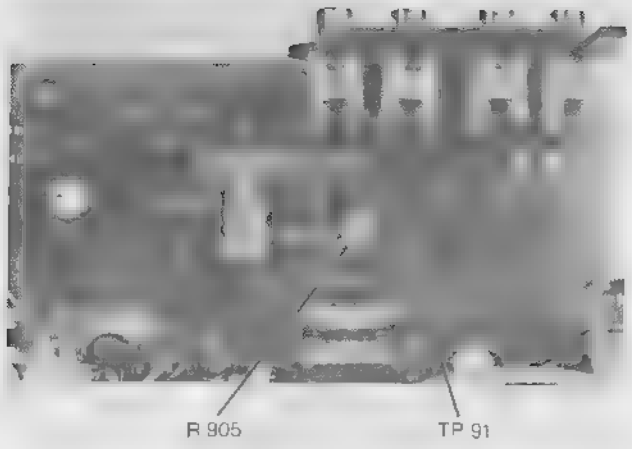


Figure 3-8. 11V adjustment

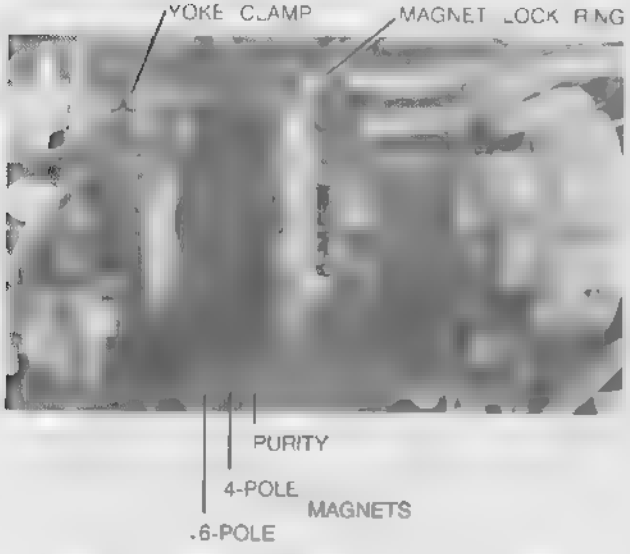


Figure 3-9. Magnet and deflection yoke assemblies

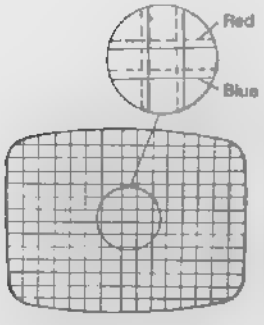


Figure 3-10. B/R registration

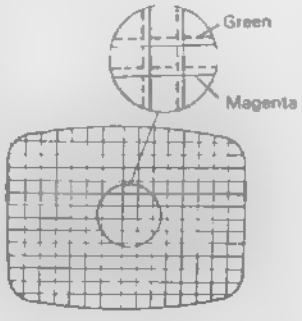


Figure 3-11. G/magenta registration

3-3-3 Static Convergence

1. Supply a crosshatch pattern from the generator. Turn Green Cutoff, R706 fully CCW and Red and Blue Cutoff, R705 and R706 fully CW
2. Adjust BRIGHT for a somewhat dim, but visible pattern.
3. Adjust the tabs on the four-pole magnet rings so that the red and blue patterns overlap to form a registered magenta pattern at center screen. Refer to Figure 3 10.
4. Turn Green Cutoff, R706 fully CW.
5. Adjust the tabs of the six-pole magnet rings so that the green pattern overlaps the magenta pattern to form a registered white pattern at center screen. Refer to Figure 3-11.

   Note: In some cases it may be necessary to adjust edge convergence roughly before Steps 3-5 give satisfactory results. See the following section.

3-3-4 Edge (Dynamic) Convergence

1. Remove the rubber wedge that supports the front edge of the deflection yoke.
2. Tilt the yoke up or down to effect best overall convergence at the screen edges. Refer to Figure 3-12 which shows the direction of convergence error where the yoke is tilted upwards. Tilting the yoke downwards moves red and blue in directions opposite to that shown.
3. Install the wedge to support the yoke in the position of best convergence. Apply model cement to hold the wedge and yoke in place.
4. Tighten all clamp screws.

3-3-5 Gray Scale Tracking

1. Supply a blank white raster signal at 75%.
2. Set the service switch, SW202 to the SERVICE setting to produce a horizontal line at mid-screen. See Figure 3-15.
3. Turn Red, Blue and Green Cutoff controls fully CCW. Refer to Figure 3-13.
4. Set the SCREEN control fully CCW. Refer to Figure 3-14.
5. Turn the SCREEN control slowly clockwise until a barely visible line appears on the screen. Note the color of that line.
6. Adjust the cutoff controls for the primaries missing in Step 5 to produce a neutral gray line
7. Set the service switch to NORMAL
8. Adjust BRIGHT for a dim raster and the cutoff controls, if needed, to produce a neutral gray raster.
9. Set CONTR to mid-range and adjust BRIGHT for a bright raster.
10. Adjust the Red and Green Drive controls for a neutral white raster.
11. Repeat Steps 9 and 10

Note: If the display jitters with the Service switch in the SERVICE setting, jump pin 1 of the deflection yoke to ground with a clip lead. Remove this jumper before resetting the switch to NORMAL.

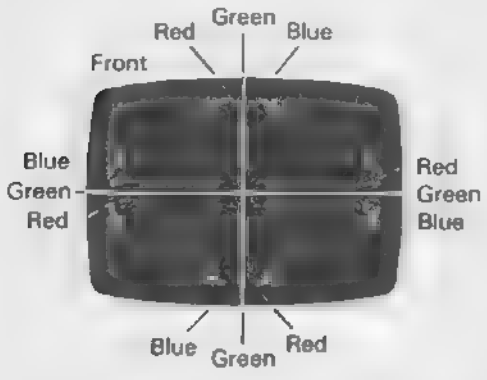


Figure 3-12. Directions of convergence error when the front of the deflection yoke is tilted upwards

3-3-6 Color Synchronization

1. Display a color bar signal, full-field preferably
2. Turn off burst at the generator. If this is not possible with the generator in use, jump TP-46 on bottom PCB to ground (TP-E) with a short clip lead
3. Use a non-metalic alignment tool and turn trimmer capacitor C312 (See Figure 3-13) so that bands of color in the color bars are minimized and color is continuous from top to bottom and changes slowly.
4. Turn on burst, or remove the jumper and confirm color lock
5. Interrupt the input signal by depressing the INPUT SELECT switch twice and confirm that color locks.

3-3-7 Subcontrast and Subbrightness

1. Display a window or stairstep signal (chroma off for the stairstep).
2. Set the top panel BRIGHT and CONTR controls to their detented settings.
3. Adjust sub-brightness, R220, so that the black border of the window signal, or the black step of the stairstep is just extinguished. Adjust sub-contrast, R212 for optimum picture contrast with no loss of focus or blooming

3-3-8 Sub-tint and Sub-color

1. Display the full-field color bar pattern.
2. Turn off red and green at the generator.
3. Refer to Figure 3-15. Adjust Sub-tint, R316, and Sub-color, R312, so that the blue bars (white, cyan, magenta, blue) are equally bright and the bars that contain no blue (yellow, green, red, black) are equally black
4. Switch on all primaries at the generator and confirm a normal color bar display.

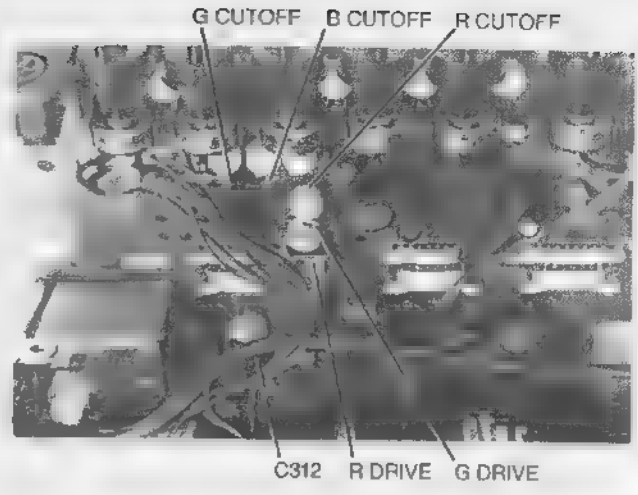


Figure 3-13. Gray-scale tracking and color synchronization controls

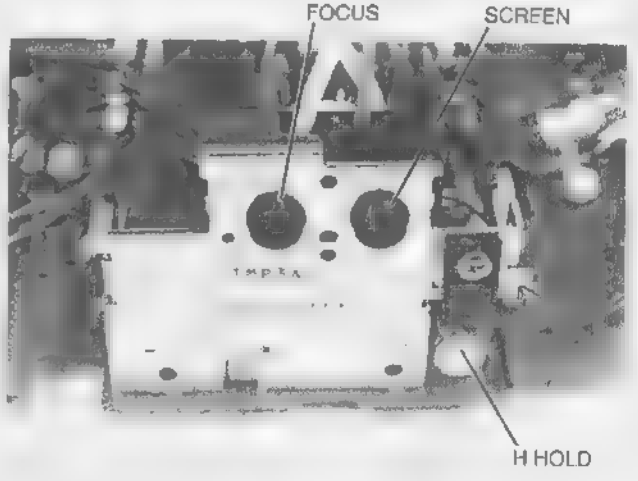


Figure 3-14. Screen, focus and H-hold controls

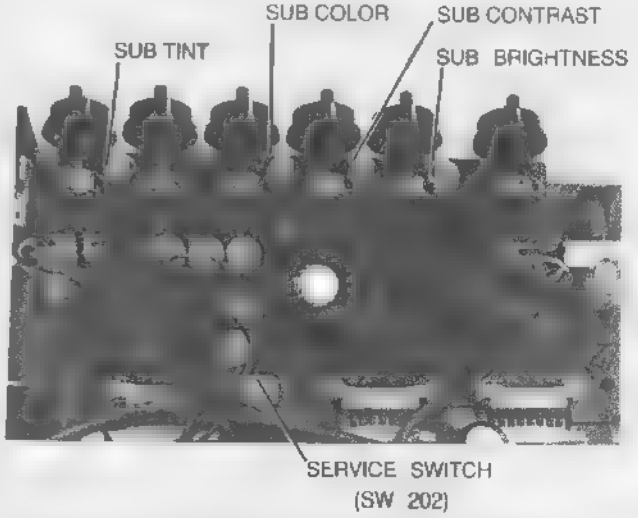


Figure 3-15. Sub controls for front panel controls

3-3-9 V Height and V Centering

1. Display the alignment pattern (crosshatch if the generator does not provide an alignment pattern).
2. Refer to Figure 3-16. Adjust V-Height, R407, to fill the screen vertically and for best circularity of the circle on the alignment pattern
3. Adjust V Center, R410, to center the pattern vertically. Reset R407 if necessary.

3-3-10 H Centering

1. Pattern as per Step 1 of 3 3 9.
2. Refer to Figure 3-16 Set the H Center switch for best horizontal centering.

3-3-11 H Hold

1. If the picture falls out of sync horizontally, adjust H Hold for a single, upright display Refer to Figure 3-14. Set to the middle of the range where the picture remains in sync
2. Interrupt the signal by depressing the INPUT SELECT switch twice. Confirm that the picture locks solidly

3-3-12 Focus

1. Supply the alignment or crosshatch pattern.
2. Set brightness for a slightly dim picture.
3. Refer to Figure 3-14. Adjust FOCUS for best overall focus. Set the control at the clockwise end of the range that produces best overall focus.

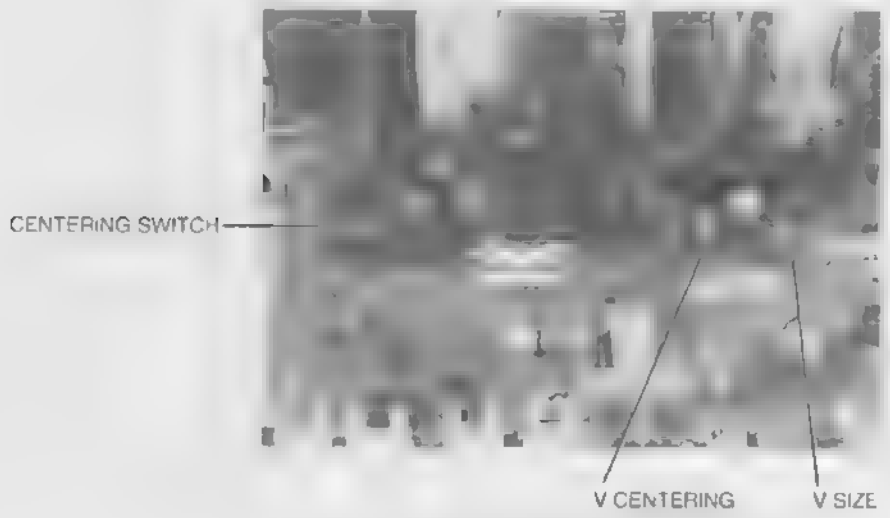


Figure 3-16. H and V deflection controls

4. WAVEFORM MONITOR MAINTENANCE

4-1 TEST EQUIPMENT REQUIREMENTS

Color Bar Generator	EIA Color Bars Leader LCG-400S/M or equivalent
DVM	
DC Power Supply	12 Vdc @ 1.0 A
Audio Generator	50 kHz - 5 MHz
75Ω BNC Terminator	Leader LFG-1310 or
75Ω 12 dB Attenuator	equivalent

4-2 DISASSEMBLY

Remove all power from units.

1. Stand the LVM-5863A on its rear surface (CRT screens facing upwards).
2. Remove the 1/4-20 hex head cap screw labelled A in Figure 4-1. Use a 3/16" hex key.
3. Place the unit flat on the work surface and unplug the BNC video INPUT plug and the coaxial DC INPUT plug (both connect to base plate plugs)
4. Lift the waveform monitor off the base plate by lifting one of the BNC plugs on rear panel When the plastic feet of the waveform monitor clear the locating holes in the baseplate, lift the monitor off and set it on the work surface.

4-2-1 Top Cover Removal

1. Remove five Phillips head screws, one at the top rear, two on each side.
2. Lift off the top cover

4-2-2 Bottom Cover Removal

1. Place the unit upside down on the work surface.
2. Remove five Phillips head screws, one at the bottom rear, two on each side.
3. Lift off the bottom cover

4-3 ADJUSTMENTS

4-3-1 Power Supply Checks and Adjustments

1. Apply power from a bench-type power supply to the DC INPUT connector on the rear panel. Set the input voltage to 12 ± 0.6 Vdc.
2. Press the POWER switch ON.
3. Check supply voltages as follows:

Test Point	Nominal V	Tolerance
1	10 V	9.41 - 10.1 V
2	5 V	4.75 - 5.25 V
3	-8 V	-7.68 - 8.32 V
4	100 V	92 - 108 V
5	150 V	138 - 162 V

Refer to Figure 4-2 for test point locations.

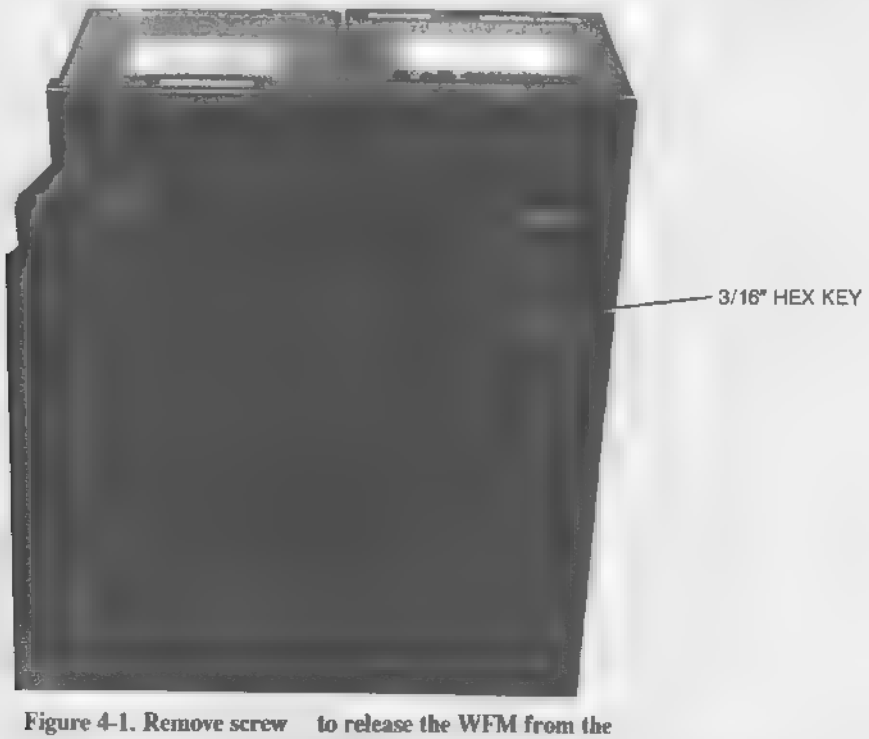


Figure 4-1. Remove screw to release the WFM from the mounting plate

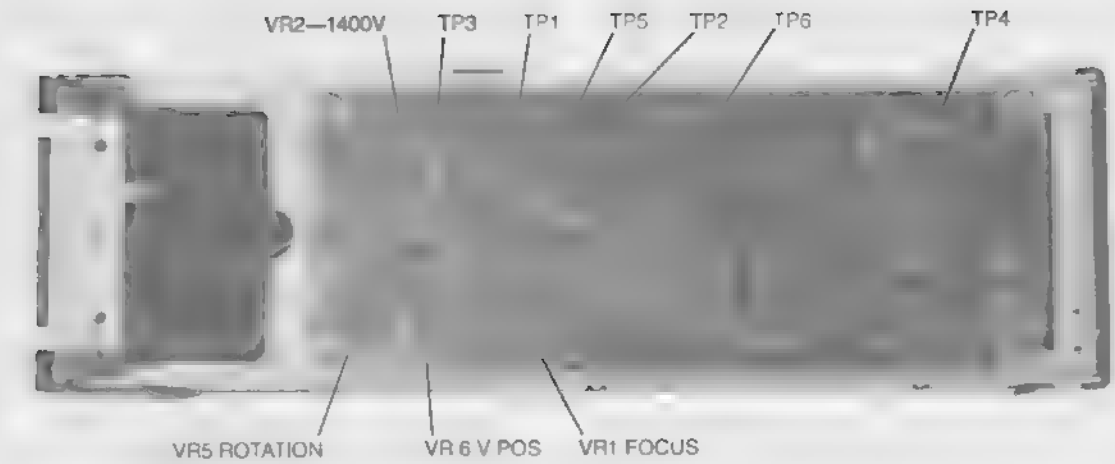


Figure 4-2. HV PC board, T-3541

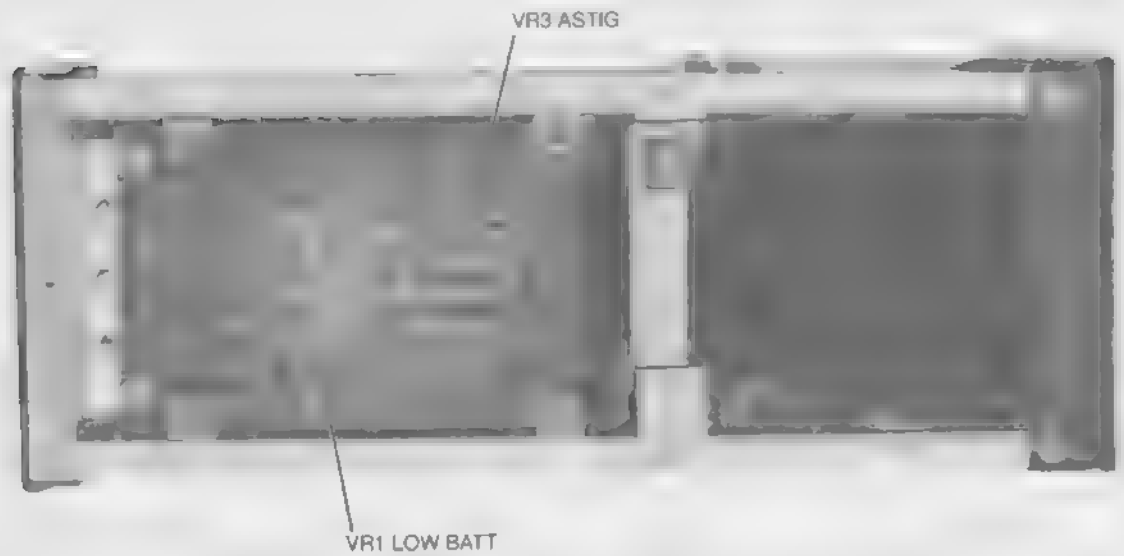


Figure 4-3. Power PC board, T-3540

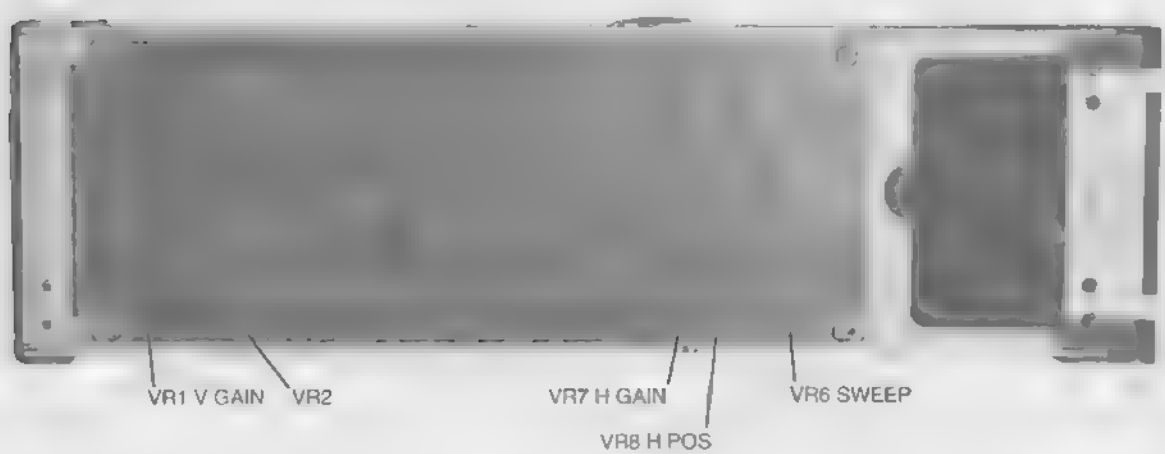


Figure 4-4. V/H amplifier PC board T3542

4. Out-of-specification measurements at the 10 V supply can be corrected by shunting R10 as follows:

Reading at TP1	Correction
9.4 - 9.9	No Correction
9.4 - 10.3	Shunt R10 with 1 MΩ
9.4 - 10.7	Shunt R10 with 430 kΩ

4-3-2 Low Battery Warning Adjustment

1. Reduce dc input voltage to 10.5 ± 0.2 V.
2. Adjust VR1, Low Battery Warning so that the POWER LED on the front panel flashes Refer to Figure 4-3.
3. Raise input voltage to 12 V. Then reset to 10.5 V and confirm that the POWER LED starts flashing when input voltage drops to 10.5 V Reset VR1 as needed
4. Reset input voltage to 12 ± 0.6 Vdc.

4-3-3 HV Adjustment

1. Monitor TP-6 on the HV power board with a DVM equipped with a high voltage probe. See Figure 4-2.
2. Adjust VR2, -1400 V adjust, for a reading of -1395 to -1405 V.

4-3-4 Sweep Time Adjustment

1. Supply an EIA color bar signal at 1 V p-p to the BNC INPUT jack on the rear panel. Use a 75Ω through terminator or terminate the LOOP THROUGH BNC jack with a 75Ω terminator.
2. Set the front panel DISPLAY switch to 2H (button in).
3. Refer to Figure 4-4. Turn VR6, SWEEP, fully CCW. Then turn VR6 clockwise slowly and note the setting at which the displayed trace becomes stable. Continue turning VR6 CW until an unstable trace resumes Reset VR6 midway between the points where trace stability is noted.
4. Depress the DISPLAY switch to release it (button out). Confirm that the 2 V trace is stable Reset VR6 if necessary.
5. Depress the display switch again to resume 2H operation.

4-3-5 Focus and Astigmatism

1. Adjust VR1, Focus, on the HV power supply board and VR8, ASTIG., on the power board for best overall focus. Refer to Figures 4-2 and 4-3 for control locations.

4-3-6 Deflection Adjustments

1. Adjust VR5, ROTATION, so that the waveform is parallel to the horizontal graticule lines. See Figure 4-2.
2. Adjust VR6, V POSITION, to place the blanking level of the signal on the zero IRE graticule line.
3. Adjust VR8, H POS, to center the middle horizontal sync pulse at the horizontal center of the display area. See Figure 4-4.
4. Adjust VR7, H GAIN, so that the end of burst and the leading edge of the sync pulse at the right of the waveform appear as shown in Figure 4-5.
5. Adjust VR1, V GAIN, so that the 100% peak white part of the signal is at 100 IRE and sync tip is at -40 IRE. Refer to Figure 4-5. Reset VR6, V POS, on the HV power supply board to correct vertical centering if necessary
6. Install a 75Ω 12 dB pad in series with the signal source and the video INPUT jack. Press to release the INPUT switch (button out).
7. Select the WINDOW signal on the video generator
8. Adjust VC1 on the switch board for the fastest rise time at the leading edge of the windows signal with minimum overshoot. Refer to Figures 4-6 and 4-7.

4-3-7 IRE Filter Adjustment

1. Connect a Function Generator to the video INPUT connector. Set the generator for sine wave operation at 50 kHz. Set the output level for a vertical deflection of 140 IRE units (reset V POS as needed).
2. Check vertical deflection at the following frequencies.

Frequency	Deflection
350 kHz	131.6 - 136.5 IRE (28.4 - 29.5 mm)
1 MHz	98.0 - 112.0 IRE (21.2 - 24.2 mm)
2 MHz	43.7 - 59.5 IRE (9.4 - 12.8 mm)
3.6 MHz	7.8 - 19.6 IRE (1.7 - 4.2 mm)

If deflection is outside the tolerances shown, reset the generator to 2 MHz and adjust L3 for a deflection of 51.6 IRE (11.1 mm). Check at 1 MHz and adjust VR-1 to produce a deflection of 105 IRE (22.7 mm).

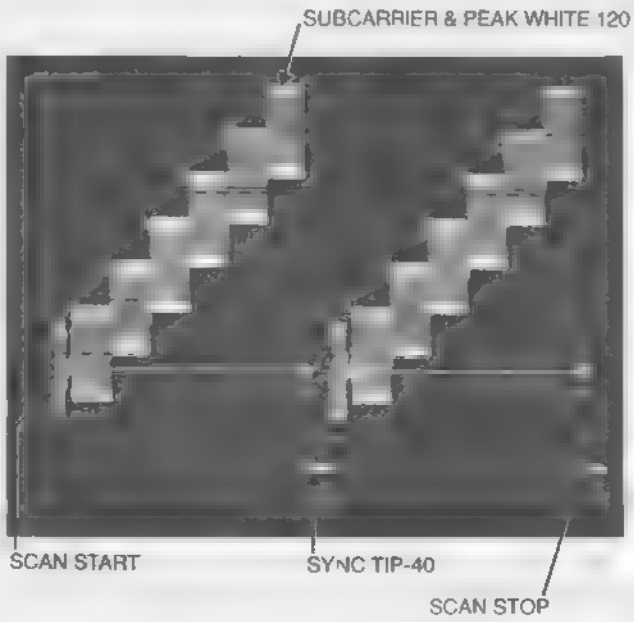


Figure 4-5. H and V gain adjustment

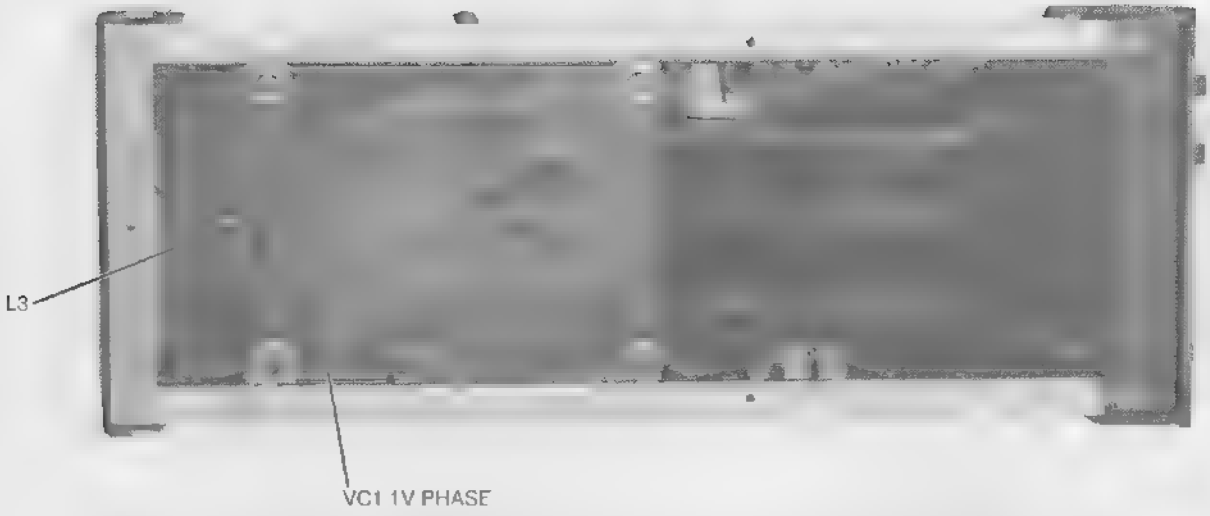


Figure 4-6. Switch PC board, T3651

Figure 4-7. Adjustment of VC1

5. PARTS LIST

5-1 PICTURE MONITOR, TMP3, PARTS LIST

5-1-1 Safety & Abbreviations

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety.
Replace only with part numbers specified.

Abbreviations in this list are as follows:

RESISTORS — All resistance values are in ohms (Ω).

k	:	1 000
M	:	1 000 000
CR	:	Carbon Resistor
Comp. R	:	Composition Resistor
WR	:	Wire Wound Resistor
OMR	:	Oxide Metal Film Resistor
VR	:	Variable Resistor (Potentiometer)
MFR	:	Metal Film Resistor
FR	:	Fusible Resistor

CAPACITORS — All capacitance values are in μF, unless otherwise indicated.

P	:	μμF
C Cap	:	Ceramic Capacitor
E Cap	:	Electrolytic Capacitor
FM Cap	:	Film Mica Capacitor
MM Cap	:	Metalized Mylar Capacitor
MP Cap	:	Metalized Paper Capacitor
MY Cap	:	Mylar Capacitor
NP Cap	:	Non-polar Capacitor
PC Cap	:	Polycarbonate Capacitor
PP Cap	:	Poly Pro Capacitor
PS Cap	:	Polystyrol Capacitor
T Cap	:	Tantalum Capacitor
TR Cap	:	Trimmer Capacitor
Chip R.	:	Chip Resistor
Chip C Cap	:	Chip C Capacitor

Tolerances of resistors or capacitors are as follows:

M	:	±20%
K	:	±10%
J	:	±5%
G	:	±2%
F	:	±1%

MAIN PCB ASS'Y TRC-1060A

CHROMA, HOR & VERT P.W.B. ASS'Y

Symbol No.	Description		
IC301	Integrated Circuit	HA11247	
IC401	Integrated Circuit	AN5762	
IC501	Integrated Circuit	AN5753	
⚠ 0501	Transistor	2SD1271A	
0502	Transistor	2SD637	
0503	Transistor	2SB641	
D401	Diode	V06C	
⚠ D501	Diode	V19E	
D502	Diode	1S2473	
D503	Diode	Y09E	
D504	Diode	V09E	
⚠ D505	Zener Diode	HZ7B2LV1	
D506	Diode	V09E	
D507	Zener Diode	HZ7B2LV1	
R301	Chip R	1.8k	1/4 W, J
R302	Chip R	1k	1/4 W, J
R303	Chip R.	10 k	1/4 W, J
R304	Chip R.	1.5 k	1/4 W, J
R305	Chip R.	1 k	1/4 W, J
R306	Chip R	680	1/4 W, J
R307	Chip R	6.8 k	1/4 W, J
R308	Chip R	4.7 k	1/4 W, J
R309	Chip R.	4.7 k	1/4 W, J
R310	Chip R	1.8 k	1/4 W, J
R401	Chip R	18 k	1/4 W, J
R402	Chip R	12 k	1/4 W, J
R403	—		
R404	CR	6.8	1/4 W, J
R405	CR	4.7	1/4 W, J
R406	Chip R	10 k	1/4 W, J
R407	VR (HEIGHT)	100 k	
R408	Chip R.	68 k	1/4 W, J
R409	Chip R.	680	1/4 W, J
R410	VR (V. CENTER)	4.7 k	
R411	Chip R.	680	1/4 W, J
R412	CR	15	1/6 W, J
⚠ FR413	FR	18	1/4 W
R414	Chip R.	4.7 k	1/4 W, J
R415	Chip R.	3.3 k	1/4 W, J
R501	Chip R.	100	1/4 W, J
R502	Chip R.	4.7 k	1/4 W, J
R503	Chip R	3.9 k	1/4 W, J
R504	Chip R	27 k	1/4 W, J
R505	Chip R.	2.7 k	1/4 W, J
R506	VR (H. HOLD)	470	
R507	Chip R.	680	1/4 W, J
FR508	FR	22	1/4 W
R509	Chip R	15 k	1/4 W, J
R510	Chip R.	68	1/4 W, J
R511	Chip R.	27 k	1/4 W, J
R512			
R513	Chip R.	27 k	1/4 W, J
FR514	FR	8.2	1/4 W

Symbol No.	Description		
R515	Chip R.	18 k	1/4 W, J
R516	Chip R.	10 k	1/4 W, J
R517	Chip R.	4.7 k	1/4 W, J
⚠ R518	R Block	CJ39520-00B	
⚠ FR519	FR	1.8	1/4 W, J
R520	Chip R	3.3 k	1/4 W, J
	CR	3.3 k	1/6 W, J
C206	Chip C Cap	270	50 V
C301	E Cap	330	16 V
C302	Chip C Cap	0.01	50 V
C303	Chip C Cap	100 P	50 V
C304	Chip C Cap	0.047	50 V
C305	E Cap	33	16 V
C306	Chip C Cap	120 P	50 V
C307	E Cap	0.47	50 V
C308	Chip C Cap	0.0022	50 V
C309	Chip C Cap	180 P	50 V
C310	Chip C Cap	22 P	50 V
C311	Chip C Cap	33 P	50 V
C312	TR Cap	1 P	
C313	Chip C Cap	47 P	50 V
C314	Chip C Cap	150 P	50 V
C315	Chip C Cap	150 P	50 V
C316	Chip C Cap	150 P	50 V
C317	Chip C Cap	0.033	50 V
C318	E Cap	4.7	50 V
C401	Chip C Cap	0.022	50 V
C402	Chip C Cap	0.022	50 V
C403	Chip C Cap	0.01	50 V
C404	T Cap	0.47	35 V
C405	T Cap	4.7	16 V
C406	T Cap	4.7	16 V
C407	E Cap	3.3	25 V
C408	E Cap	10	16 V
C409	E Cap	100	16 V
C410	E Cap	220	10 V
C411	MY Cap	0.022	50 V
C412	E Cap	330	16 V
C413	E Cap	10	16 V
C501	Chip C Cap	0.01	50 V
C502	Chip C Cap	100 P	50 V
C503	Chip C Cap	0.015	50 V
C504	Chip C Cap	0.018	50 V
C505	Chip C Cap	0.027	50 V
C506	E Cap	4.7	25 V
C507	E Cap	330	16 V
C508	PP Cap	0.0039	50 V
C509	M Cap	0.001	50 V
C510	Chip C Cap	0.0047	50 V
C511		—	
C512	E Cap	330	16 V
C513			
C514	PP Cap	0.01	400 V
C515	PP Cap	0.018	400 V
C516	C Cap	0.047	50 V
C517	E Cap	0.47	50 V
C518	E Cap	100	16 V
C519	E Cap	4.7	100 V
C520	E Cap	1.0	16 V
C521	E Cap	100	10 V

Symbol No.	Description		
C522			
C523			
C524			
⚠ C525	C Cap	1000	3 kV
L301	Peaking Coil		
K501	Core		
⚠ L502	Linearity Coil		
⚠ L503	Width Coil		
T30.	BP Trans Ass'y		
T501	H Drive Trans		
⚠ T502	FB Trans		
X30.	CRYSTAL		
S50	Slide Switch		
⚠	Focus Pack		
	Test Point	TP-33, 46	
	Connector Base	4P	

VIDEO & CHROMA OUT P.W.B. ASS'Y

Symbol No.	Description		
IC201	Integrated Circuit	HA11401	
Q201	Transistor	2SD637	
Q202	Transistor	2SB641	
Q203	Transistor	2SB641	
Q701	Transistor	2SD662	
Q702	Transistor	2SD662	
Q703	Transistor	2SD662	
D904	Diode	1S247H-Y	
D905	Diode	V06C	
R201	CR	1 k	1/4 W, J
R202	CR	47 k	1/4 W, J
R203	CR	47 k	1/4 W, J
R204	CR	2.7 k	1/4 W, J
R205	CR	4.7 k	1/4 W, J
R206	CR	680	1/4 W, J
R207	CR	220	1/4 W, J
R208	CR	560	1/4 W, J
R209	CR	56 k	1/4 W, J
R210	CR	15 k	1/4 W, J
R211	Chip R.	560	1/4 W, J
R212	VR (SUB CONTR)	2.2 k	
R213	Chip R.	2.2 k	1/4 W, J
R214	Chip R	39 k	1/4 W, J
R215	Chip R	1.8 k	1/4 W, J
R216	Chip R	330	1/4 W, J
R217	Chip R	470	1/4 W, J
R218	Chip R	22 k	1/4 W, J
R219	Chip R	470	1/4 W, J

Symbol No.	Description		
R220	VR (SUB BRIGHT)	1 k	
R221	VR (BRIGHT)	300	
R222	Chip R.	4.7 k	1/4 W, J
R223	Chip R.	8.2 k	1/4 W, J
R224	VR (CONTR)	10 k	1/4 W, J
R225	Chip R.	1.8 k	1/4 W, J
R226			
R227	Chip R.	1 k	1/4 W, J
R228	Chip R.	100	1/4 W, J
R311	Chip R.	1 k	1/4 W, J
R312	VR (SUB COLOR)	10 k	
R313	VR (COLOR)	10 k	
R314	Chip R.	100	1/4 W, J
R315	Chip R.	6.8 k	1/4 W, J
R316	VR (SUB TINT)	22 k	
R317	VR (TINT)	5 k	
R318	Chip R.	5.6 k	1/4 W, J
R420	Chip R.	39 k	1/4 W, J
R421	VR (V. HOLD)	50 k	
R604	Chip R.	39 k	1/4 W, J
R605	VR (VOLUME)	20 k	
R701	Chip R.	1 k	1/4 W, J
R702	Chip R.	1 k	1/4 W, J
R703	Chip R.	1 k	1/4 W, J
R704	VR (B. CUT OFF)	4.7 k	
R705	VR (R. CUT OFF)	4.7 k	
R706	VR (G. CUT OFF)	4.7 k	
R707	Chip R.	560	1/4 W, J
R708	VR (R. DRIVE)	1 k	
R709	VR (G. DRIVE)	1 k	
R710	CR	18 k	1/2 W, J
R711	CR	18 k	1/2 W, J
R712	CR	18 k	1/2 W, J
R713	CR	10 k	1/4 W, J
R714	CR	5.6 k	1/4 W, J
R715	CR	10 k	1/4 W, J
R912	Chip R.	22 k	1/4 W, J
R913	Chip R.	15 k	1/4 W, J
C201	E Cap	10	25 V
C202	E Cap	10	25 V
C203	Chip C Cap	1.5	50 V
C204	E Cap	3.3	50 V
C205	T Cap	0.47	35 V
C206	—	—	
C207	Chip C Cap	0.01	50 V
C208	E Cap	330	16 V
C209	E Cap	3.3	50 V
C210			
C211	Chip C Cap	330 P	50 V
C701	Chip C Cap	390	50 V
C702	Chip C Cap	390	50 V
C703	Chip C Cap	390	50 V
DL201	Delay Line		
S202	Slide Switch		
S901	Push Switch		

Symbol No.	Description	
J701	Din Socket	A/V in out
	Test Point	TP-47B

AUDIO & POWER REG. P.W.B. ASS'Y

Symbol No.	Description		
IC601	Integrated Circuit	M51182L	
⚠ Q902	Transistor	2SB641	
⚠ Q903	Transistor	2SB637	
⚠ Q904	Transistor	2SD1251	
D901	Diode	1S2473 H-Y	
D902	Diode	1S2473 H-Y	
⚠ D903	Zener Diode	RD5.6E	
R231	Chip R.	150	1/4 W, J
R232	Chip R.	150	1/4 W, J
R233	Chip R.	150	1/4 W, J
R234	Chip R.	150	1/4 W, J
R601	Chip R.	56 k	1/4 W, J
R602	Chip R.	270	1/4 W, J
R603	CR	10	1/2 W, J
R901	Chip R.	6.8 k	1/4 W, J
R902	Chip R.	1.5 k	1/4 W, J
R903	Chip R.	1.8 k	1/4 W, J
⚠ R904	MFR	2.7 k	1/4 W, F
⚠ R905	VR	1 k	
⚠ R906	MFR	3.83 k	1/4 W, F
R907	Chip R.	220	1/4 W, J
FR908	FR	15	1/4 W
C601	E Cap	0.1	50 V
C602	Chip C Cap	0.01	50 V
C603	E Cap	33	16 V
C604	TF Cap	0.47	50 V
C605	Chip C Cap	0.0015	50 V
C606	E Cap	330	16 V
C607	E Cap	100	10 V
C608	Chip C Cap	0.0022	50 V
C901	Chip C Cap	0.001	50 V
C902	Chip C Cap	0.001	50 V
S201	Push Switch		
⚠ F901	Fuse	0.8 A	125 V
J201	Jack		
J202	Jack		
J601	Jack		
J602	Jack		
	TEST POINT	TP-91	
	Connector Base	4P	

Symbol No.	Description	
J602	Connector Base Connector Base	4P 3P

POWER REG P.W.B. ASS'Y

Symbol No.	Description	
⚠ Q90	Transistor	2SB945

INPUT SELECT IND. P.W.B. ASS'Y

Symbol No.	Description	
D910 D911	L E D L E D	LN222RP LN222RP
R9	C n p R	10 k 1/4 W, J

5-2 WAVEFORM MONITOR, LBO-5864, PARTS LIST

LBO-5864 WAVEFORM MONITOR MAIN FRAME

Symbol No.	Description	
	DIODE	
D1	LED	TLS164 "PWR"
	CRT	
	CR1	85YB31Y (T9-15)
	COIL	
L3	Beam Rotator	L-757
	SWITCH	
S1	PUSH	PH A1SK1S1 "PWR"
	MISCELLANEOUS	
J21	Connector	BNC-BR-241 "Input"
J22	Connector	BNC-BR-241 "Input"
J23	Jack	J-23 X-G 4005 "DC input"

POWER SUPPLY BOARD T-3540

Symbol No.	Description			
	RESISTORS			
R1	Carbon film	1/6W	1.5k ohm	5%
R2	Carbon film	1/6W	2.2k ohm	5%
R3	Carbon film	1/6W	22k ohm	5%
R4	Carbon film	1/6W	47k ohm	5%
R5	Carbon film	1/6W	47k ohm	5%
R6	Carbon film	1/6W	27k ohm	5%
R7	Carbon film	1/6W	3.9k ohm	5%
R8	Carbon film	1/6W	180 ohm	5%
R9	Carbon film	1/6W	560 ohm	5%
R10	Metal film	1/6W	30k ohm	1%
R11	Metal film	1/6W	4.3k ohm	1%
R12	Metal film	1/6W	16k ohm	1%
R13	Metal film	1/6W	12k ohm	1%
R14	Carbon film	1/6W	22 ohm	5%
R15	Carbon film	1/6W	22 ohm	5%
R16	Carbon film	1/6W	1k ohm	5%
R17	Carbon film	1/6W	220k ohm	5%
R18	Carbon film	1/6W	100 ohm	5%
R19	Metal film	1/6W	120k ohm	1%
R20	Carbon film	1/6W	180 ohm	5%
R21	Carbon film	1/6W	100 ohm	5%
R23	Carbon film	1/6W	470 ohm	5%
R24	Metal film	1/6W	1.3k ohm	1%
R25	Metal film	1/6W	910 ohm	1%
R26	Carbon film	1/6W	560 ohm	5%
R27	Carbon film	1/6W	220k ohm	5%
R28	Metal film	1/6W	10k ohm	1%
R29	Metal film	1/6W	10k ohm	1%
R30	Metal film	1/6W	180k ohm	1%
R31	Metal film	1/6W	47k ohm	1%
R33	Metal film	1/6W	30k ohm	1%
R34	Metal film	1/6W	30k ohm	1%
R35	Carbon film	1/6W	18k ohm	5%
R36	Carbon film	1/6W	6.8k ohm	5%
R37	Carbon film	1/6W	82k ohm	5%
R38	Metal film	1/6W	27k ohm	1%
R39	Metal film	1/6W	33k ohm	1%
R40	Metal film	1/6W	300k ohm	1%
	VARIABLE RESISTORS			
VR1	Cermet	1/3W	1k ohm	20%
VR3	Cermet	1/3W	1M ohm	20%
	CAPACITORS			
C1	Electrolytic	25V	10UF	20%
C2	Ceramic	25V	1.5UF	
C3	Electrolytic	25V	47UF	20%
C4	Electrolytic	35V	3.3UF	20%
C5	Electrolytic	16V	10UF	20%
C6	Composition	500V	0.75PF	10%
C7	Ceramic	50V	0.1UF	
C8	Ceramic	250V	0.01UF	
C9	Ceramic	250V	0.01UF	
C10	Electrolytic	16V	100UF	20%
C11	Electrolytic	25V	1UF	20%
C12	Mica	500V	12PF	10%
C13	Electrolytic	25V	10UF	20%
C14	Electrolytic	16V	100UF	20%
	TRANSISTORS			
Q1	PNP		2SB435-Y	
Q2	NPN		2SC1815-GR	
Q3	NPN		2SC2911-S	
Q4	NPN		2SC2911 S	
Q5	NPN		2SC1279S-E	
Q6	NPN		2SC752(G)TM-0	
Q7	NPN		2SC752(G)TM 0	
Q8	NPN		2SC2562-Y	

Symbol No.	Description		
	TRANSISTORS		
Q9	NPN	2SC2562-Y	
Q10	NPN	2SC2551-0	
Q11	PNP	2SA1207	
Q12	PNP	2SA1207	
Q13	PNP	2SA1207	
	DIODES		
D1	Zener	RD6, 2EB	6.2V
D2	Detector	1SS83	
D3	Zener	RD5, 1EB	5.1V
	INTEGRATED CIRCUITS		
IC1	OP Amp	TL082	
IC2	Regulator	M5236L	
IC3	Regulator	NJM78L05A	+5V,
IC4	OP Amp	TL081CP	
	COILS		
L1	Coil	4.7UH	10%
L2	Coil	30UH	
	FUSE		
F1	Time Lag	ST4	1.6A
	MISCELLANEOUS		
	Fuse Clip	H-0017-1	
	Fuse Clip	H-0017-1	

HIGH VOLTAGE BOARD T-3541

Symbol No.	Description			
	RESISTORS			
R1	Carbon film	1/6W	68k ohm	5%
R2	Metal film	1/6W	20k ohm	1%
R3	Carbon film	1/6W	2.2 ohm	5%
R4	Carbon film	1/2W	47k ohm	5%
R5	Thick film	1/4W	2.2M ohm	5%
R6	Thick film	1/2W	2.7M ohm	5%
R7	Thick film	1/2W	2.7M ohm	5%
R8	Metal film	1/6W	62k ohm	1%
R9	Carbon film	1/6W	47k ohm	5%
R10	Carbon film	1/6W	220k ohm	5%
R11	Carbon film	1/6W	1k ohm	5%
R12	Carbon film	1/6W	22k ohm	5%
R13	Thick film	1/2W	10M ohm	5%
R14	Thick film	1/4W	22M ohm	5%
R16	Metal film	1/6W	100k ohm	1%
R17	Carbon film	1/6W	470k ohm	5%
R18	Carbon film	1/6W	120 ohm	5%
R19	Carbon film	1/6W	180 ohm	5%
R20			0 ohm	
R21	Metal film	1/6W	68k ohm	1%
	VARIABLE RESISTORS			
VR1	Metal film	1/2W	2.2M ohm	25%
VR2	Cermet	1/3W	30k ohm	20%
VR5	Cermet	1/2W	20k ohm	20% "Rotation"
VR6	Cermet	1/2W	20k ohm	20% "V Position"

Symbol No.	Description			
	CAPACITORS			
C1	Mica	50V	56PF	10%
C2	Plastic film	50V	1000PF	5%
C3	Electrolytic	10V	10UF	20%
C4	Electrolytic	10V	10UF	20%
C5	Electrolytic	10V	10UF	20%
C6	Plastic Film	630V	0.022UF	10%
C7	Ceramic	2KV	0.01UF	
C8	Ceramic	2KV	0.01UF	
C9	Ceramic	2KV	0.01UF	
C11	Ceramic	2KV	220PF	10%
C12	Ceramic	50V	1000PF	
C13	Electrolytic	10V	10UF	20%
C14	Plastic film	63V	0.047UF	10%
C15	Ceramic	2KV	0.01UF	
C16	Ceramic	2KV	0.01UF	
C17	Ceramic	2KV	0.01UF	
C18	Ceramic	250V	0.01UF	
C19	Electrolytic	200V	2.2UF	20%
C20	Electrolytic	250V	2.2UF	20%
C21	Electrolytic	200V	2.2UF	20%
C22	Electrolytic	200V	2.2UF	20%
C23	Electrolytic	16V	220UF	20%
C24	Electrolytic	25V	1UF	20%
C25	Electrolytic	250V	2.2UF	20%
	TRANSISTOR			
Q1	NPN		2SC3149	
	DIODES			
D1	Detector		1SS83	
D2	Detector		1SS83	
D3	Detector		1SS83	
D4	Detector		1SS83	
D6	Rectifier HV	1.6KV	ES01F	
D7	Rectifier HV	1.6KV	ES01F	
D8	Rectifier HV	1.6KV	ES01F	
D9	Detector		1S1588	
D10	Detector		1SS83	
D11	Detector		1SS83	
D12	Detector		1SS83	
D13	Detector		1SS83	
D14	Detector		1SS83	
D15	Detector		1SS83	
D16	Detector		1SS83	
D17	Detector		1SS83	
D18	Detector		1SS83	
D19	Detector		1SS83	
D20	Detector		1SS83	
D21	Detector		1SS83	
D22	Detector		1SS83	
D23	Detector		1S1588	
	INTEGRATED CIRCUITS			
IC1	CMOS		TC74HC04P	
IC2	CMOS		TC4011BP	
IC3	Regulator		HA17808P	+8V
	TRANSFORMER			
T1	Transformer		J-530 DC-DC Converter	
	COILS			
L1	Coil		470UH	10%
L2	Coil		470UH	10%

Symbol No	Description		
	MISCELLANEOUS		
V1	Neon Bulb	NE-38B	
V2	Neon Bulb	NE-38B	
V3	Neon Bulb	NE-38B	

V, H AMP BOARD T-3542

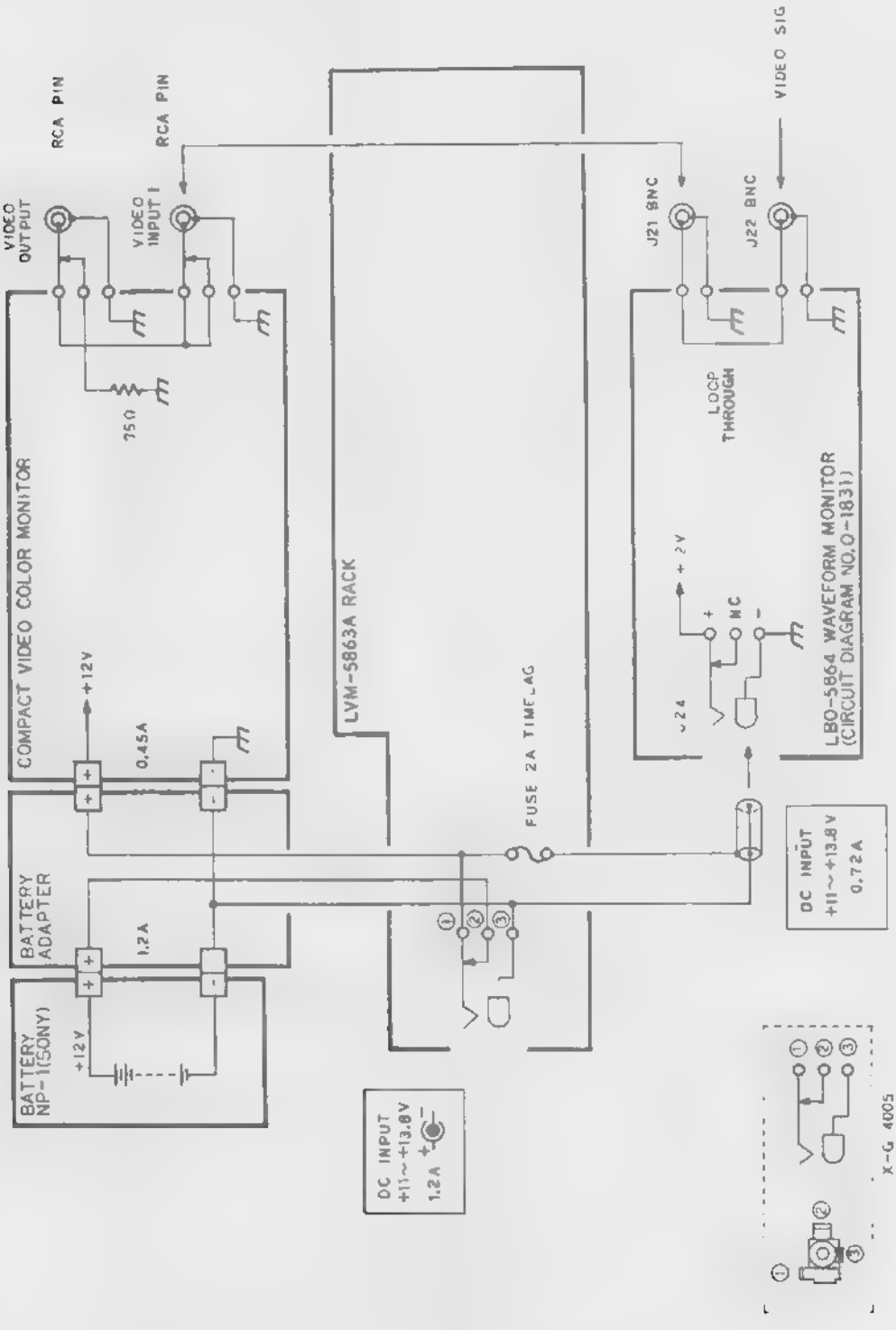
Symbol No.	Description			
	RESISTORS			
R8	Metal film	1/6W	270 ohm	1%
R9	Carbon film	1/6W	47 ohm	5%
R10	Metal film	1/6W	620 ohm	1%
R11	Carbon film	1/6W	1k ohm	5%
R12	Carbon film	1/6W	1k ohm	5%
R13	Metal film	1/6W	620 ohm	1%
R16	Carbon film	1/6W	3.3k ohm	5%
R17	Carbon film	1/6W	100 ohm	5%
R20	Carbon film	1/6W	47 ohm	5%
R21	Carbon film	1/6W	47 ohm	5%
R22	Metal film	1/4W	2k ohm	1%
R23	Metal film	1/4W	2k ohm	1%
R24	Metal oxide	2W	682 ohm	5%
R25	Metal oxide	2W	682 ohm	5%
R26	Metal film	1/6W	47k ohm	1%
R27	Carbon film	1/6W	1M ohm	5%
R30	Carbon film	1/6W	10k ohm	5%
R31	Carbon film	1/6W	8.2k ohm	5%
R32	Carbon film	1/6W	4.7k ohm	5%
R33	Carbon film	1/6W	10k ohm	5%
R34	Thick film	1/4W	98M ohm	1%
R35	Carbon film	1/6W	470k ohm	5%
R36	Carbon film	1/6W	47k ohm	5%
R37	Carbon film	1/6W	1M ohm	5%
R38	Carbon film	1/6W	470k ohm	5%
R39	Carbon film	1/6W	470k ohm	5%
R40	Carbon film	1/6W	180k ohm	5%
R41	Carbon film	1/6W	150 ohm	5%
R42	Carbon film	1/6W	1k ohm	5%
R43	Carbon film	1/6W	10k ohm	5%
R44	Carbon film	1/6W	39k ohm	5%
R45	Carbon film	1/6W	39k ohm	5%
R46	Metal film	1/6W	9.1k ohm	1%
R47	Metal film	1/6W	18k ohm	1%
R48	Metal film	1/6W	36k ohm	1%
R49	Carbon film	1/6W	10k ohm	5%
R50	Carbon film	1/6W	6.8k ohm	5%
R51	Carbon film	1/6W	2.7k ohm	5%
R52	Carbon film	1/6W	2.7k ohm	5%
R53	Carbon film	1/6W	10k ohm	5%
R54	Metal film	1/6W	4.7k ohm	1%
R55	Metal film	1/6W	3k ohm	1%
R56	Metal film	1/6W	12k ohm	1%
R57	Metal film	1/6W	1k ohm	1%
R58	Carbon film	1/6W	100 ohm	5%
R59	Metal film	1/6W	2.7k ohm	1%
R60	Metal film	1/6W	2.7k ohm	1%
R61	Carbon film	1/6W	100 ohm	5%
R62	Carbon film	1/6W	10k ohm	5%
R63	Metal film	1/6W	3.9k ohm	1%
R64	Metal film	1/6W	1.3k ohm	1%

Symbol No	Description			
	RESISTORS			
R65	Metal film	1/6W	5.1k ohm	1%
R66	Metal oxide	1W	39k ohm	5%
R67	Metal oxide	1W	39k ohm	5%
R68	Carbon film	1/6W	10k ohm	5%
R69	Carbon film	1/6W	10k ohm	5%
R70	Carbon film	1/6W	10k ohm	5%
R71	Carbon film	1/6W	10k ohm	5%
R72	Carbon film	1/6W	47k ohm	5%
R73	Carbon film	1/6W	4.7k ohm	5%
R74	Metal film	1/6W	560 ohm	1%
R76	Metal film	1/6W	5.6k ohm	1%
R77	Metal film	1/6W	5.1k ohm	1%
R78	Metal film	1/6W	10k ohm	1%
R79	Metal film	1/6W	10k ohm	1%
R80	Carbon film	1/6W	100k ohm	5%
R81	Metal film	1/6W	12k ohm	1%
R82	Metal film	1/6W	4.7k ohm	1%
R83	Carbon film	1/6W	12k ohm	5%
R83	Metal film	1/6W	27k ohm	1%
R84	Metal film	1/6W	68k ohm	1%
R87	Carbon film	1/6W	47 ohm	5%
R88	Carbon film	1/6W	18k ohm	5%
R90	Carbon film	1/6W	68k ohm	5%
R91	Carbon film	1/6W	8.2k ohm	5%
R92	Carbon film	1/6W	1M ohm	5%
R93	Carbon film	1/6W	33k ohm	5%
R94	Metal film	1/6W	220k ohm	1%
R95	Metal film	1/6W	1M ohm	1%
R96	Metal film	1/6W	330k ohm	1%
R97	Carbon film	1/6W	100k ohm	5%
R98	Carbon film	1/6W	560 ohm	5%
R99	Metal film	1/6W	5.6k ohm	1%
R100	Metal film	1/6W	2k ohm	1%
R10	Metal film	1/6W	330 ohm	1%
	VARIABLE RESISTORS			
VR1	Cermet	1/3W	200 ohm	20%
VR2	Cermet	1/3W	2k ohm	20%
VR6	Cermet	1/3W	5k ohm	20%
VR7	Cermet	1/3W	10k ohm	20%
VR8	Cermet	1/3W	5k ohm	20%
	CAPACITORS			
C6	Ceramic	25V	1.5UF	
C7	Ceramic	50V	0.01UF	
C8	Electrolytic	16V	10UF	20%
C9	Mica	50V	120PF	10%
C10	Plastic Film	50V	390PF	10%
C11	Mica	500V	22PF	10%
C12	Mica	50V	82PF	10%
C13	Electrolytic	25V	10UF	20%
C14	Electrolytic	16V	10UF	20%
C16	Electrolytic	16V	10UF	20%
C19	Electrolytic	16V	10UF	20%
C21	Plastic film	50V	180PF	10%
C22	Ceramic	250V	0.01UF	
C23	Plastic film	50V	220PF	10%
C24	Ceramic	50V	820PF	10%
C25	Mica	500V	12PF	10%
C26	Plastic film	63V	0.1UF	10%
C27	Electrolytic	25V	10UF	20%
C30	Ceramic	50V	270PF	10%
C31	Electrolytic	16V	10UF	20%

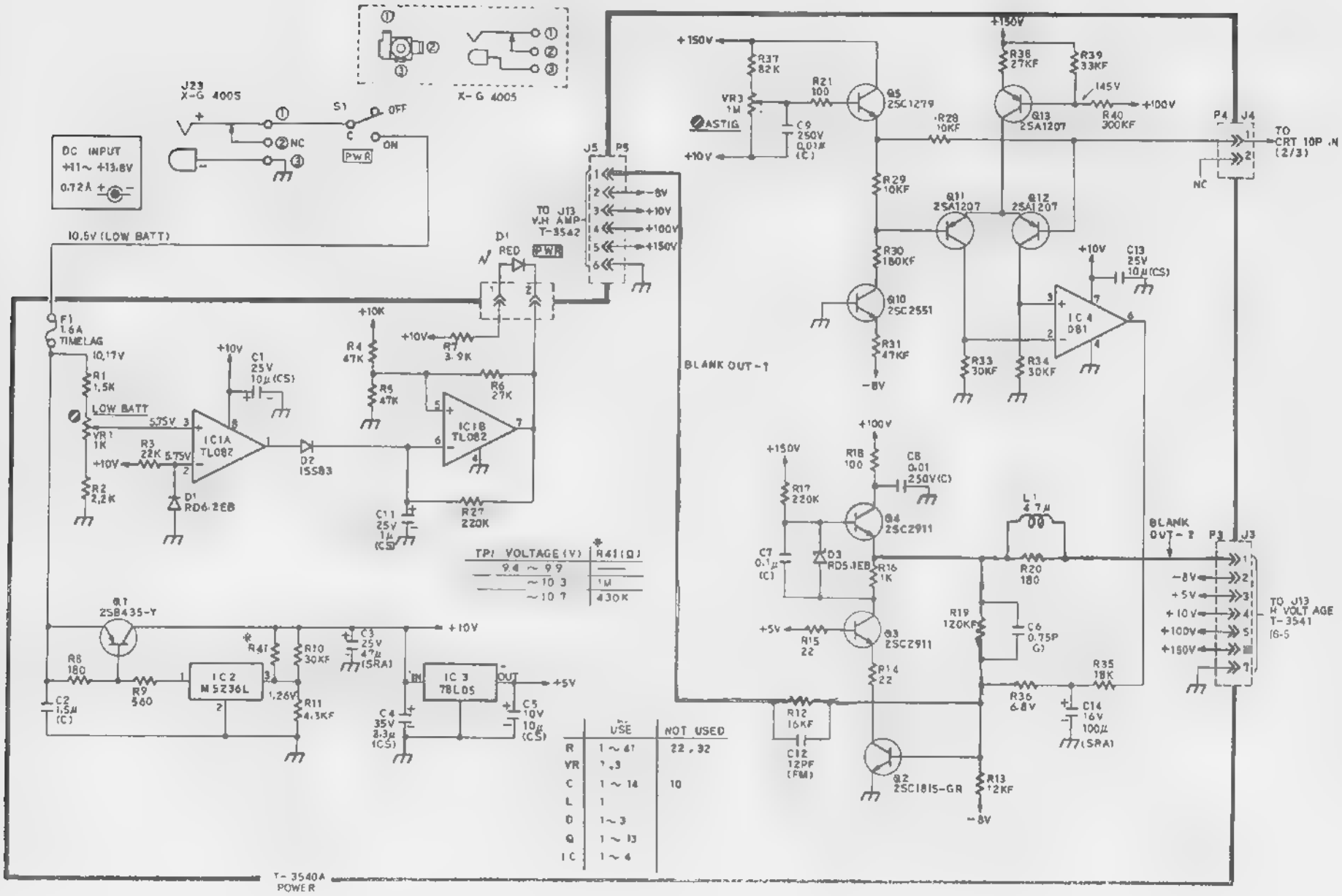
Symbol No.	Description			
	CAPACITORS			
C32	Plastic film	63V	0.1UF	10%
C35	Electrolytic	25V	10UF	20%
C36	Plastic film	50V	8200PF	5%
C37	Plastic film	50V	220PF	10%
C38	Electrolytic	25V	10UF	20%
C39	Electrolytic	25V	10UF	20%
C40	Plastic film	100V	0.01UF	1%
C41	Electrolytic	25V	10UF	20%
C42	Electrolytic	16V	10UF	20%
C43	Plastic film	50V	0.01UF	5%
C44	Electrolytic	16V	10UF	20%
C45	Ceramic	50V	330PF	10%
C46	Ceramic	50V	0.01UF	
C47	Ceramic	250V	0.01UF	
C48	Ceramic	50V	470PF	10%
C49	Mica	500V	10PF	10%
C50	Mica	500V	22PF	10%
C51	Plastic film	50V	0.018UF	5%
C52	Plastic film	63V	0.047UF	10%
C54	Electrolytic	25V	10UF	20%
C56	Electrolytic	16V	22UF	20%
C57	Electrolytic	16V	22UF	20%
C60	Electrolytic	25V	10UF	20%
C61	Electrolytic	25V	10UF	20%
	TRANSISTORS			
Q3	NPN		2SC1815-GR	
Q4	NPN		2SC1815-GR	
Q7	NPN		2SC2912-S	
Q8	NPN		2SC2912-S	
Q9	PNP		2SA1015-GR	
Q10	NPN		2SC2912-S	
Q11	NPN		2SC2912-S	
Q12	NPN		2SC1815-GR	
Q13	NPN		2SC1815-GR	
Q14	NPN		2SC752(G)TM 0	
Q15	NPN		2SC1815-GR	
	DIODES			
D1	Detector Dual		MC921	
D2	Detector		1S1588	
D3	Detector		1S1588	
D4	Zener	6.2V	RD6, 2EB	
D6	Detector		1S1588	
D7	Detector		1S1588	
D8	Detector		1S1588	
D9	Zener	4.7V	RD4, 7EB	
	INTEGRATED CIRCUITS			
IC1	OP AMP		CA-3080	
IC2	CMOS		TC4528BP	
IC3	OP AMP		CA3240E	
IC4	Comparator		CA3290E	
IC5	Comparator		LM393N	
IC6	CMOS		TC4528BP	
IC7	OP AMP		TL082	
IC8	OP AMP		TL080CP	
IC9	OP AMP		TL082	
IC10	CMOS		TC4011BP	
IC11	CMOS		TC4066BP	
	COIL			
L1	Coil		330UH	10%

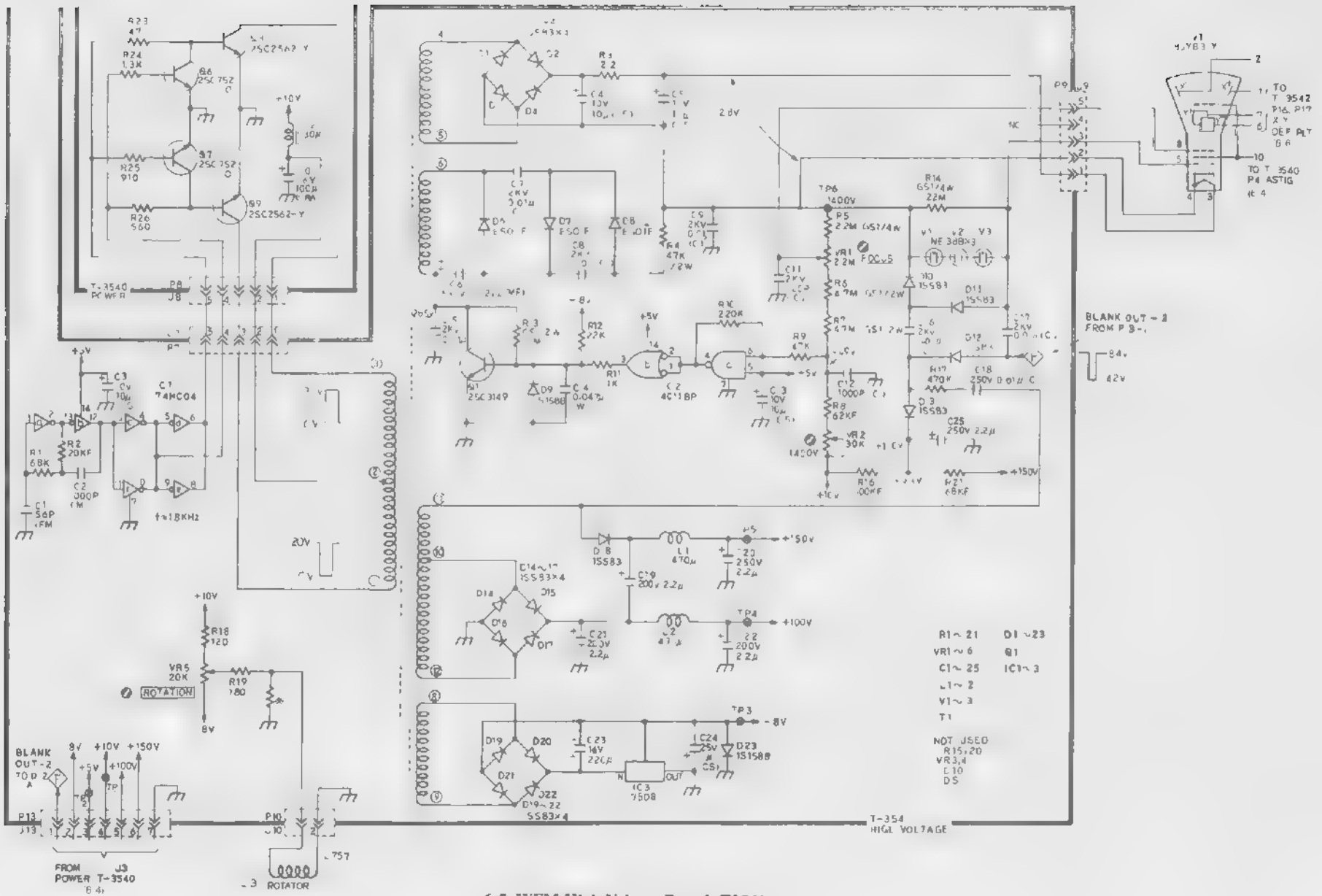
SWITCH BOARD T-3651

Symbol No.	Description			
	RESISTORS			
R1	Metal film	1/6W	15k ohm	1%
R2	Carbon film	1/6W	2.2M ohm	5%
R3	Carbon film	1/6W	47 ohm	5%
R5	Carbon film	1/6W	150 ohm	5%
R6	Carbon film	1/6W	10k ohm	5%
R7	Carbon film	1/6W	2.7k ohm	5%
R8	Metal film	1/6W	330 ohm	1%
R9	Metal film	1/6W	18k ohm	1%
R10	Metal film	1/6W	27k ohm	1%
R11	Carbon film	1/6W	47 ohm	5%
R12	Carbon film	1/6W	8.2k ohm	5%
R13	Carbon film	1/6W	47 ohm	5%
R14	Carbon film	1/6W	3.3k ohm	5%
	VARIABLE RESISTOR			
VR1	Cermet	1/3W	100 ohm	20%
	CAPACITORS			
C1	Mica	500V	27PF	10%
C2	Ceramic	50V	0.01UF	
C3	Electrolytic	16V	10UF	20%
C4	Electrolytic BP	10V	100UF	20%
C5	Ceramic	50V	0.01UF	
C6	Electrolytic	25V	10UF	20%
C7	Plastic film	100V	470PF	2%
C8	Mica	500V	22PF	10%
C9	Mica	50V	100PF	10%
C10	Ceramic	50V	1000PF	
C11	Mica	500V	27PF	10%
	VARIABLE CAPACITOR			
VC1	Ceramic	250V	2-12PF	
	TRANSISTORS			
Q1	PNP		2SA872E	
Q2	NPN		2SC1815-GR	
Q3	NPN		2SC1815-GR	
Q4	PNP		2SA1015 GR	
	DIODE			
D1	Detector		1S1588	
	COILS			
L1	Coil		0.12UH	10%
L2	Coil		0.12UH	10%
L3	Coil		L-779	
	SWITCHES			
S1	Push		SPPJ6 2-2, S "Input"	
S2	Push		SPPJ6 2-2, S "Filter"	
S3	Push		SPPJ6 2-2, S "Display"	

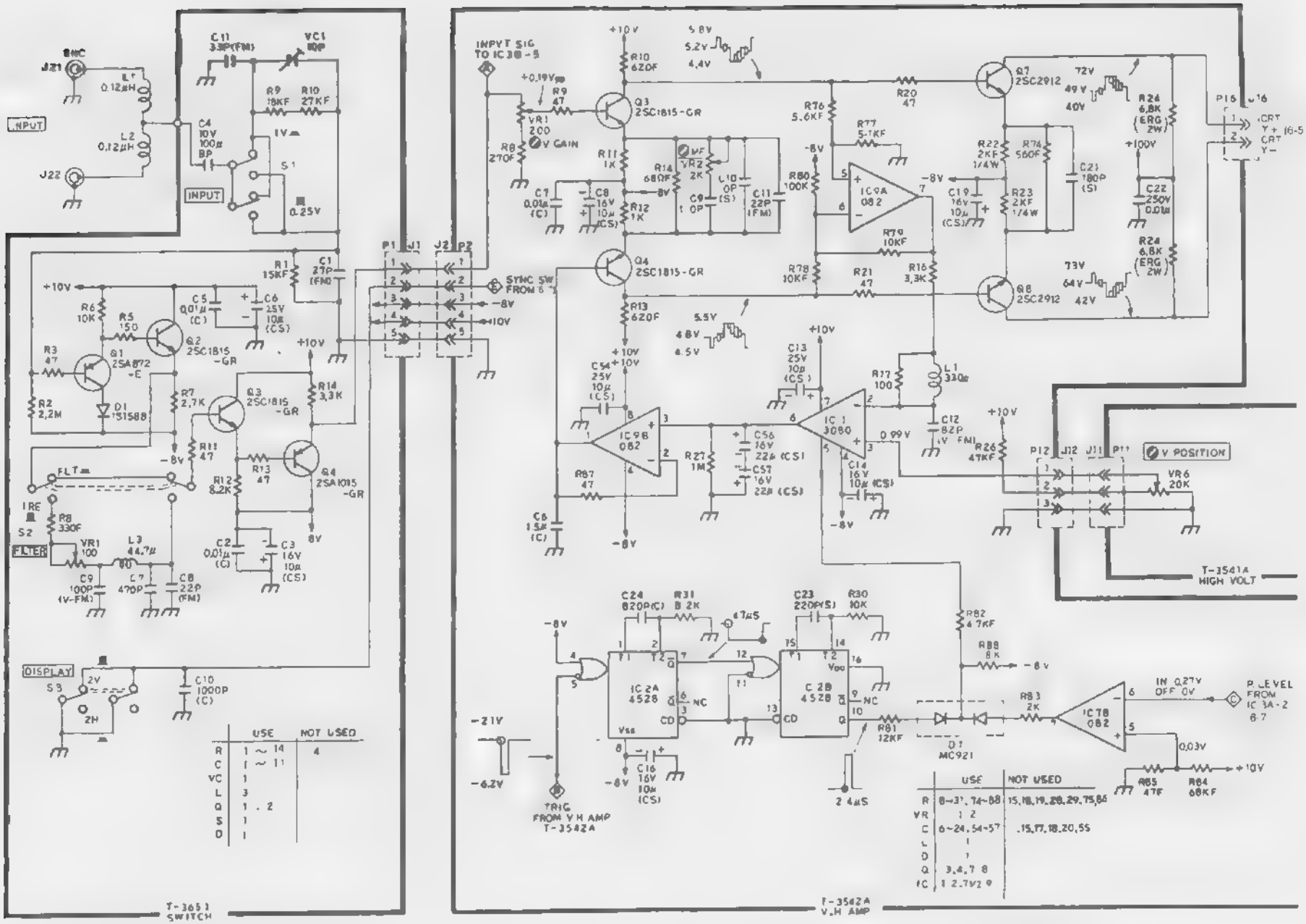


6-3 Frame DC and Video Signal Schematic

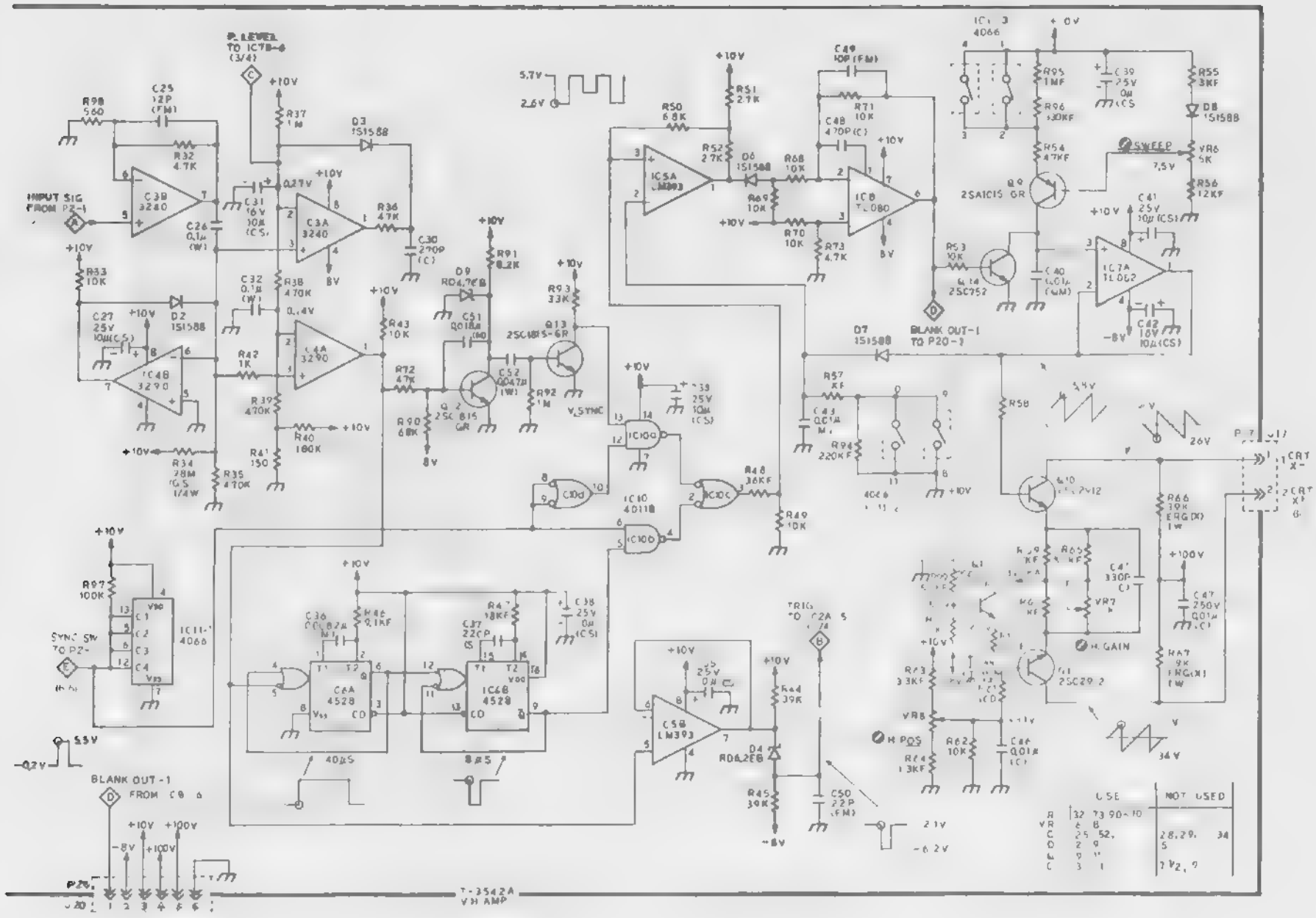

J23
X-G 4005
X-G 4005
S1
OFF
ON
PWR
DC INPUT
+11~ +13.8V
0.72A
10.5V (LOW BATT)
F1
1.6A
TIMELAG
D1
RED
PWR
J5 P5
TO J13
V.H AMP
T-3542
+150V
+100V
+10V
-8V
+5V
BLANK OUT-1
BLANK OUT-2
LOW BATT
IC1A TL082
IC1B TL082
IC2 M5236L
IC3 78L05
IC4 D81
Q1 2SA1207
Q2 2SC1815-GR
Q3 2SC2911
Q4 2SC2911
Q5 2SC1279
Q10 2SC2551
Q11 2SA1207
Q12 2SA1207
Q13 2SA1207
Q7 2SB435-Y
D1 RD6.2EB
D2 1SS83
D3 RD5.1EB
TP1 VOLTAGE (V)
R41 (Ω)
9.4 ~ 9.9
~10.3
~10.7
1M
430K
TO CRT 10P .N (2/3)
TO J13 H VOLTAGE T-3541 (6-5)
T-3540A POWER
USE
NOT USED
R 1 ~ 41
22, 32
VR 1, 3
C 1 ~ 14
10
L 1
D 1 ~ 3
Q 1 ~ 13
IC 1 ~ 4



6-5 WFM High Voltage Board, T3541



6-6 WFM Switch and V/H Amp Boards, T3651 and 3542A



6-7 WFM V/H Amp Board, T3542A

WARNING!

THE SERVICING INSTRUCTIONS CONTAINED IN THIS MANUAL ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

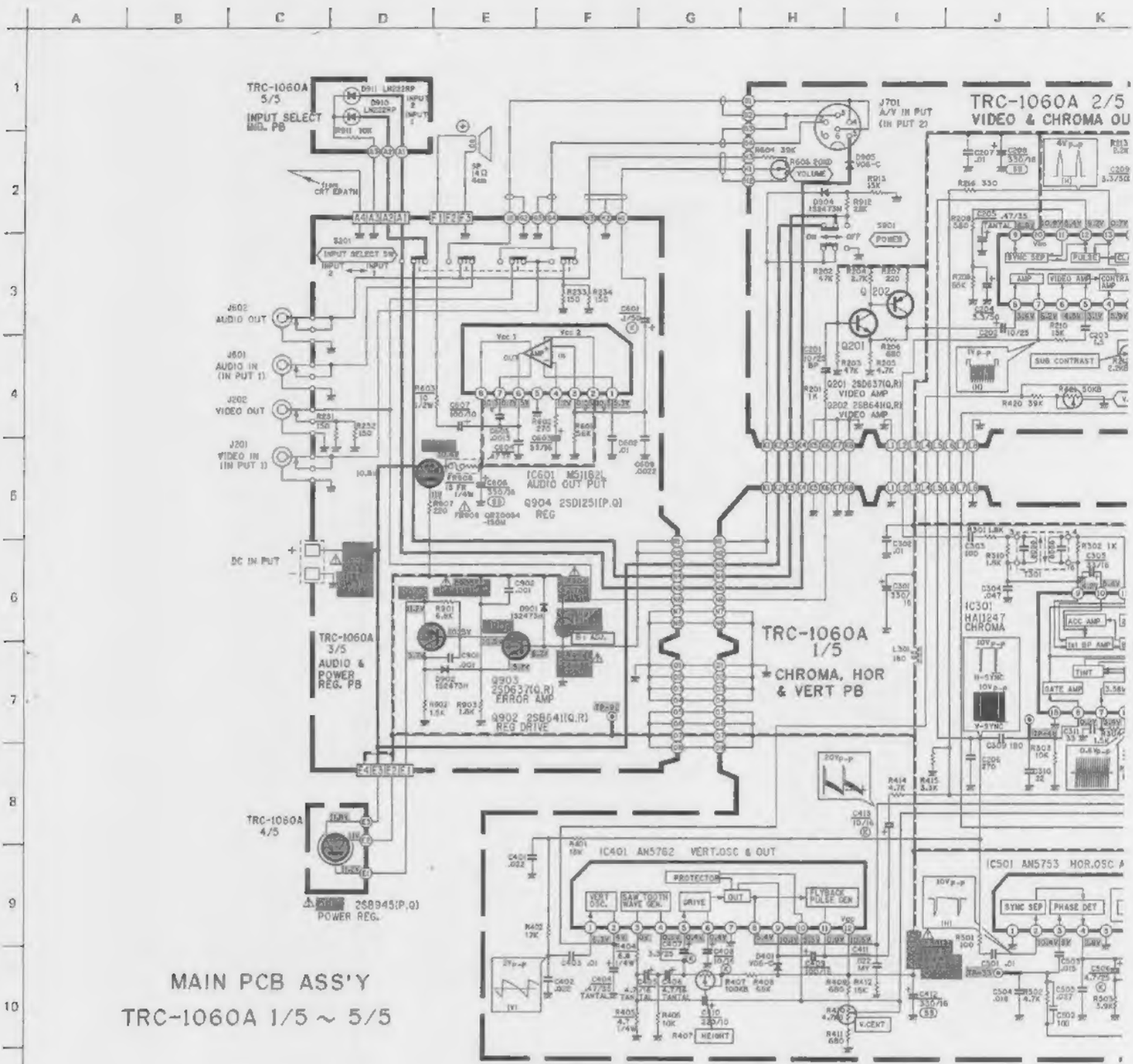
LEADER INSTRUMENTS CORP.

TWO YEAR WARRANTY POLICY

Leader Instruments Corporation warrants its products to be free from defects in materials and workmanship for a period of two years from the date of purchase. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. Products must be returned to a Leader Service Center with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and date and place of purchase. This warranty does not apply to equipment which has been damaged by accident, negligence, or mis-application or has been altered or modified in any way. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.

LEADER INSTRUMENTS CORP.

5.2 SCHEMATIC DIAGRAM



NOTE

1) ALL VOLTAGES SHOW READINGS BY CIRCUIT TESTER 120 KΩ/V) ON RECEPTION OF 1Vp-p COLOR BAR VIDEO SIGNAL.
2) ALIGNMENT OPERATION FOR USER * SERVICE
3) ALL RESISTANCE VALUES ARE IN OHMS K: 1,000 Ω M: 1,000,000 Ω WATAGES ARE 1/4 W UNLESS OTHERWISE INDICATED.

UNSPECIFIED	:	CARBON RESISTOR ±5%
COMP	:	COMPOSITION RESISTOR ±10%
CMR	:	OXIDE METAL FILM RESISTOR
CMRF	:	

4) CAPACITANCE VALUES LESS THAN 1 ARE IN μF AND 1 AND ABOVE IN PF EXCEPT THAT ELECT. CAPACITORS ARE IN μF. RATING VOLTAGE IS 50 WV UNLESS OTHERWISE INDICATED. TOLERANCE FOR CAPACITANCE J ±5% K ±10% M ±30% Z $\pm^{80}_{20}$%

UNSPECIFIED : CERAMIC CAPACITOR
1000 pF AND ABOVE $\pm^{80}_{20}$%
LESS THAN 1000 pF ±5%

ELECT. CAPACITOR :
$\pm^{10}_{10}$% LESS THAN 4.7 μF $\pm^{75}_{10}$%
CAPACITANCE (μF)/WORKING VOLTAGE

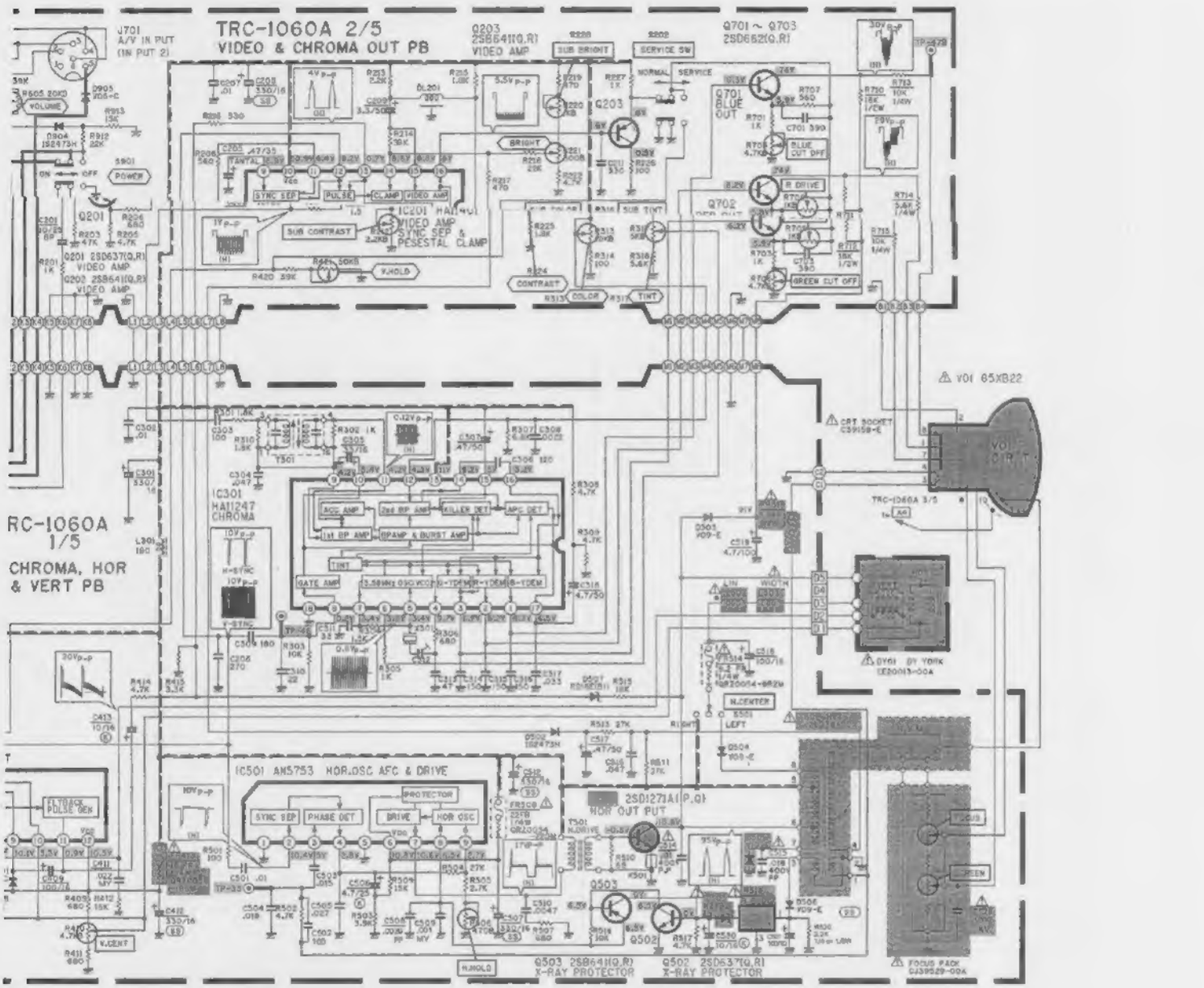
B	:	THERMINAL DEVIATION ±10%
CH,RH	:	TEMPERATURE COEFFICIENT ±6%
PP	:	POLYPROPYLENE CAPACITOR ±10%
MY	:	MYLAR CAPACITOR ±10%
TA	:	TANTAL ELECT. CAPACITOR ±20%
PS	:	POLYSTYROL CAPACITOR ±5%

5) SELECTOR SW (POSITION)

S201	:	INPUT SELECT SW
S302	:	SERVICE SW
S801	:	H. CENTER SW
S901	:	POWER SW (OFF)

SHAFETY PRECAUTION

The symbol and shaded ( ) are critical for safety. Replace only with specified part numbers.



	B	:	THERMINAL DEVIATION	±10%
	CH,RH	:	TEMPERATURE COEFFICIENT	±5%
	PP	:	POLYPROPYLENE CAPACITOR	±10%
	MY	:	MYLAR CAPACITOR	±10%
	TA	:	TANTAL ELECT. CAPACITOR	±20%
	PS	:	POLYSTYROL CAPACITOR	±5%

B) SELECTOR SW (POSITION)

S201	:	INPUT SELECT SW
S202	:	SERVICE SW
S501	:	H. CENTER SW
S901	:	POWER SW (OFF)

B) SYMBOL NUMBERS OF THE SUBMINIATURE CHIP PARTS (RESISTORS, CAPACITORS) ARE NOT UNDERLINED
(EX.) R151, C151
VALUES ARE CALCULATED AS FOLLOWS

< Chip Resistor >

12 × 10(Pasteri) = 12(Ohm)

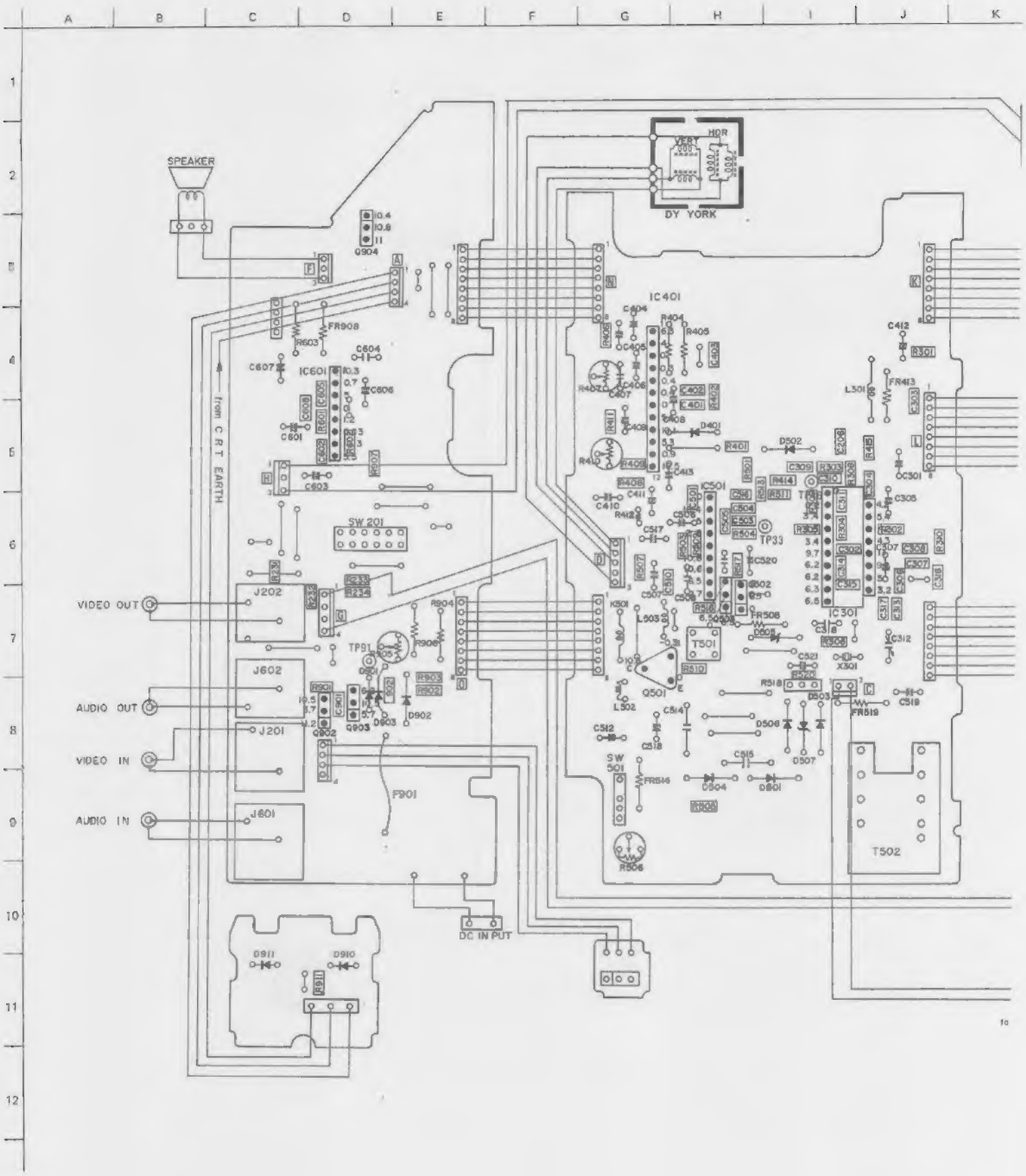
< Chip Capacitor >

K,M,Z ..... Tolerance
C,P,R,S,T,U ..... Temperature Compensation type

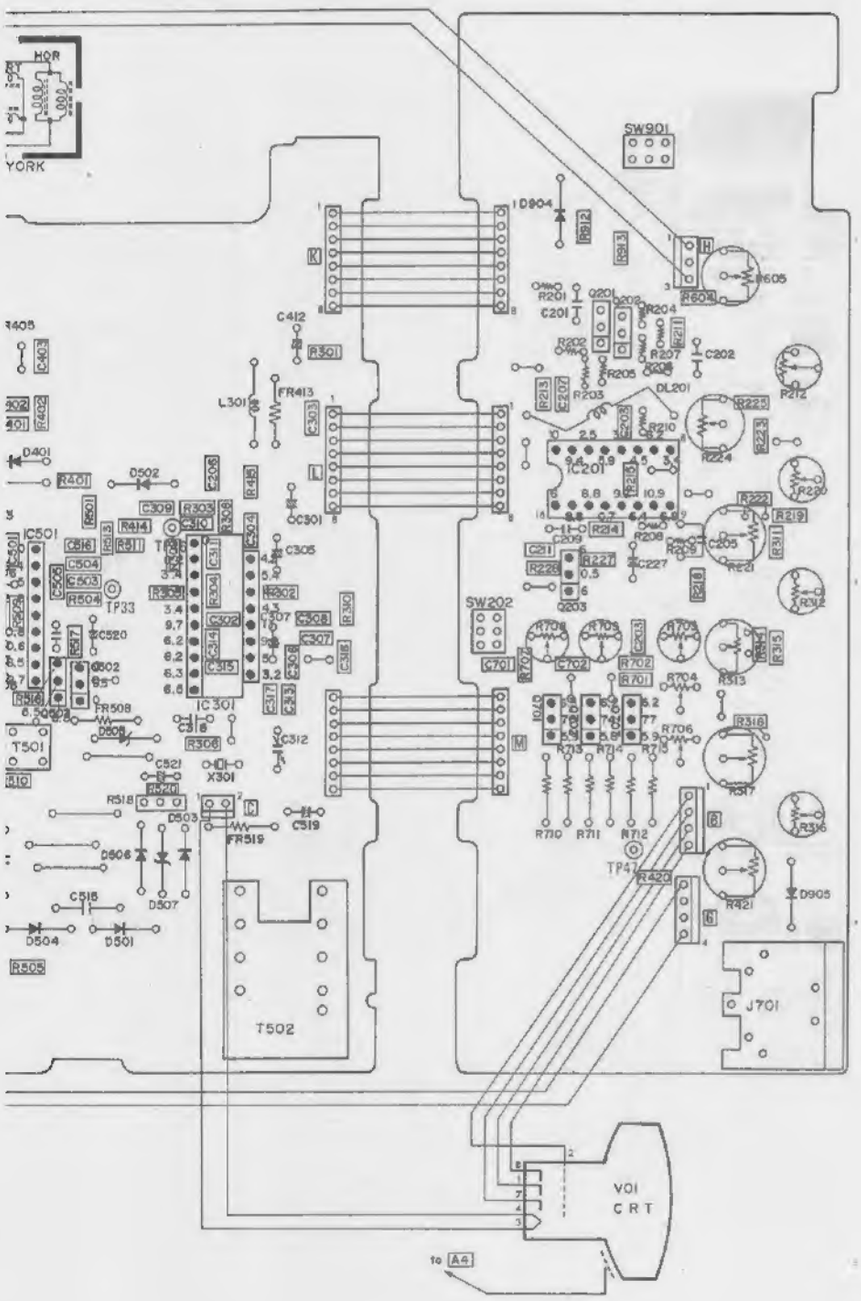
12 × 10(PF) = 12 × 10⁻⁶(μF) = 0.012(μF)

ied part numbers.

5.3 CIRCUIT BOARD

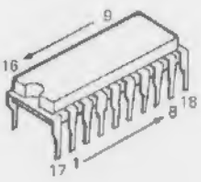


H | I | J | K | L | M | N | O | P | Q | R

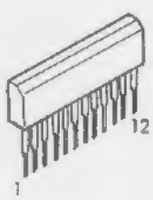


IC & Transistor Basing

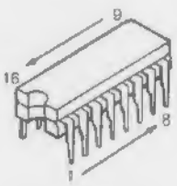
– HA11247 –



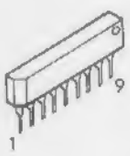
– AN5762 –



– HA11401 –

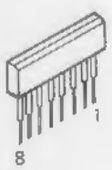


– AN5753 –



– 2SD1251 (P,Q) –

– M51182L –



– 2SB946 (P,Q) –
– 2SD1271A(P,Q) –

– 2SB641 (Q,R) –
– 2SD637 (Q,R) –
– 2SD662 (Q,R) –